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The Methodist Temperance Manual

By
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M.A., F.G.S., F.R.M.S.,

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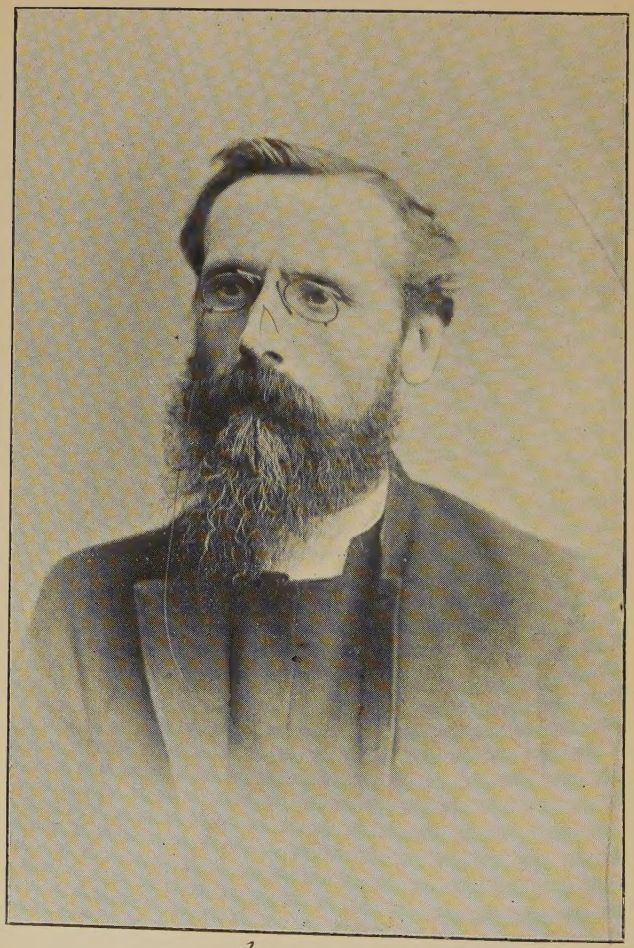

Yours Faithfully

W. Spiers

THE METHODIST TEMPERANCE MANUAL.

A Handbook for Temperance Workers and Band of Hope Conductors.

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BY

REV. WILLIAM SPIERS,

M.A., F.R.M.S.,

Author of "Rambles and Reveries of a Naturalist," "Physiological Aspect of Temperance," "Talks with my Band of Hope," etc., etc.

WITH A CHAPTER ON

THE CONTROL OF THE LIQUOR TRAFFIC,

BY

REV. G. ARMSTRONG BENNETTS, B.A.,

Wesleyan Connexional Temperance Secretary.

London:

CHARLES H. KELLY, 2, Castle St., City Road, E.C.;

and 26, Paternoster Row.

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PREFACE.

THE first edition of this book was prepared at the request of the Wesleyan Connexional Temperance Committee. That it has supplied a real want is sufficiently demonstrated by the fact that a very large edition has become exhausted.

The aim of the Author has been to state the results of the scientific study of Alcohol, especially in relation to its effects on the human body, in language as simple as the subject admits of; and it is believed that no young person of ordinary capacity can fail to follow the descriptions and arguments used.

Many leading Temperance men have expressed approval and admiration of the work, and the Author takes this opportunity of expressing his thanks for the unsolicited testimonies which he has received.

Although the book was written primarily to afford help to Temperance Workers connected with the Methodist Church, it is gratifying to learn that it has found its way into a far wider circle. In Ireland it has been selected as the Text-book for the Examinations in Temperance Knowledge organised

by the Irish Methodist Temperance Committee, and the British Wesleyan Conference has authorised its inclusion in the list of books recommended to be read by ministers on probation.

The present edition differs from the former in no essential particular. Mr. Bennetts' chapter on the "Control of the Liquor Traffic" has been partly re-written in order to bring it abreast of the most recent legislation, but the bulk of the matter is of such a nature that no alterations have been found necessary save a few slight changes for the purpose of attaining greater simplicity of expression. The scientific foundations of the Temperance question have been well and truly laid by experts of the highest character and skill, and it is not easy to see how the conclusions arrived at by men like Carpenter and Richardson can ever need serious modification.

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CHAPTER I.

ALCOHOL.

THIS little book is about Alcohol. We purpose explaining what it is and what it is not ; what it does, and how it does it ; what its effects are on the human body and on the mental and moral faculties of those who use it ; and its influence in relation to the wealth and prosperity of the nation.

A good deal that will be said has been said before. We make no claim to any great amount of originality. But information that is scattered about in many books is hardly accessible to the generality of readers, and there still seems to be wanting some easy and non-technical summary of such truths about alcohol as are well established. Some of the experiments that we shall describe have been repeated by us again and again for the benefit of those whose instruction we have sought ; and where this has not been done, we have taken care to advance nothing that has not received sanction from our most qualified chemists and physiologists. For such as desire to make a thorough study of the questions bearing on the Science of Temperance, we need do no more than

recommend them to the sources which we have found of the most value in writing these pages. Dr. W. B. Carpenter's prize essay on the "Use and Abuse of Alcoholic Liquors," though superseded to some extent, still retains its place as a temperance classic. Dr. Miller's "Alcohol: its Place and Power," is full of most accurate and valuable scientific information, though its style is not all that could be wished. Sir B. W. Richardson's various works on Temperance are indispensable, and we must gratefully express our indebtedness to his "Cantor Lectures," to which we shall repeatedly have to refer. For a recent and complete survey of the whole field, embracing the chemical, physiological, medical, social, and political aspects of the Temperance question, we know of nothing superior to the prize essay on "Alcohol and Science" by Dr. W. Hargreaves, of Philadelphia. In addition to these masterly productions, we may mention Dr. F. R. Lees' "Science Temperance Text-Book," Mr. F. R. Cheshire's "Scientific Temperance Handbook," Dr. Norman Kerr's "Wines: Scriptural and Ecclesiastical," Mr. A. A. Reade's "Study and Stimulants," Dr. Lees' "Temperance Bible Commentary," and the works of Pasteur on "Fermentation." Lallemand and Perrin's papers on Anæsthetics, and Dr. Anstie's account of his experiments, given in the *Practitioner* for 1874, are necessary in order to understand one important controversy. Dr. Maudsley's "Responsibility in Mental Diseases" furnishes many most impressive facts on the injuries

caused to brain and mind by intemperance. The Fiske prize essay on "Alcohol and Tuberculous Diseases" should be read by all who can get it. And, to learn from our opponents, we have made some use of "The Wine and Spirit Merchant's Companion," and one or two other books of a similar character. Various other works have given us some help, but it will be sufficient to refer to these incidentally as occasion arises.

Our object will be not to denounce, but to supply facts. Mere declamation has its uses and its appropriate times, but we desire to assist young people and temperance advocates to understand the *pros* and *cons* of the drink question. We shall not shrink from pointing out what we consider to be the grave perils to which those who indulge in intoxicants are exposed, and no fear of being regarded as fanatical will prevent us from distinctly declaring the whole naked truth so far as we understand it. Enthusiastic we confess to being, as every intelligent person ought to be when so much that is precious is at stake as is involved in the drinking habits of our time ; but fanaticism, or at any rate that type of it which sees only one side of the shield, and curses all who affirm that there is another side, we disclaim and abhor. We shall probably not even say that it is a sin to use intoxicants, though we are convinced that for many it is sinful, and for almost all imprudent. It will content us to point out the perils and temptations arising from the constant use of so deadly a drug as alcohol, and

pursue the "more excellent way" of leaving choice and action to the understanding and conscience, hoping, at the same time, that no one will be able to peruse these pages without being convinced of the wisdom of adopting the principles of Total Abstinence.

Meaning of the Word "Alcohol."

The word "alcohol" is of Arabic origin, and was probably used first of all to denote a subtle essence. Sir B. W. Richardson informs us that the earliest scientific use of the term occurs in an old chemistry book, dated 1698, where it is stated that "the spirit of wine well rectified is called the alcohol of wine." The thing itself, however, was discovered perhaps as early as the eleventh century by an Arabian alchemist, one of those strange old-time philosophers who were always trying to get gold out of something or other. These mysterious men were continually observing that there was some kind of subtle essence or spirit coming off from the materials on which they were experimenting in their alembics, and at length one of them was able to demonstrate the existence of it in fermenting wine. For thousands of years the human race had been drinking the spirit of wine, but it had never been recognised before. Although its discoverer was not able to find out very much about it, yet he could give it a name. He called it Al-ghoul, the evil spirit, as though predicting the disastrous results it

was destined to produce. When we think of the wrecked homes, the ruined lives, the blighted reputations, the vices and crimes, the sins against God's laws, the lost souls, which are the dire fruits of intemperance, we must feel that no more appropriate name could possibly have been invented for that which causes so much woe, suffering, and death, than "the Evil Spirit."

Forms in which Alcohol is Consumed.

Every kind of intoxicating drink in common use contains alcohol in greater or less proportion. All wines, spirits, and malt liquors, all beverages which derive their stimulating properties from the products of fermentation and distillation, are indebted to alcohol for their special and distinguishing character. They may be mixed with water, and coloured or flavoured with various vegetable or mineral ingredients, but in every case it is alcohol which constitutes the intoxicating element, except, of course, where poisonous adulteration has been practised. It is not uncommon to hear persons congratulating themselves upon the fact that though they take wine or beer, yet they scrupulously avoid the use of spirits. The only difference, however, between such an individual and a brandy-drinker is that the spirit is taken in different quantities. Both of them consume alcohol. A man who would be shocked at the idea of drinking half a pint of brandy a day, but who complacently swallows a couple of pints of strong ale, or four pints of London

porter, imbibes precisely the same quantity of alcohol as if he drank the ardent spirit.

Brandy is got by distillation of wine, and derives its name from the German *branntwein*, or burnt wine. Rum comes from cane sugar, and the word is probably nothing more than the last syllable of the word "*saccharum*," which means "sugary." Gin gets its name from the French *genièvre*, or juniper, the berries of which are used to give the spirit a pungent taste. Whiskey is produced from malt sugar, and the name has grown out of the old word "*usige*," which is short for *usquebaugh*, and means "water of life." Ale and beer are obtained by brewing, the alcohol in them arising from fermentation. Ale is the Norse *öl*, which, however, the Scandinavians brewed, not from malt, but from a red berry growing wild in their country. The word beer is a modified form of the old Saxon name for the liquor brewed from barley. In later years hops were added, for the sake of their flavour. In malting, the barley is steeped in water till it begins to sprout, when it is at once dried by means of a hot kiln. This stops the growth of the barley, and then fermentation commences, of which we shall have more to say presently. London porter is coloured with burnt malt, and stout is nothing more than strong porter. Malt liquors contain from five to ten parts of alcohol in every hundred, wine varies from ten to twenty-five, and spirits range up to as much as fifty-four, brandy, the strongest of all, containing this quantity ; that is, more than one-half of it consists

of pure alcohol, though, of course, these proportions vary, according to the skill or the conscience of the publican. These are the figures given by Sir W. B. Richardson, and are probably a fair average, though other chemists have found even more alcohol in some samples of highly fortified wines and spirits.

It is reported that in some of the American gambling saloons the taste of the consumers is so depraved that both spirits and wine are fortified to an almost incredible degree.

Composition of Alcohol.

Alcohol in a pure state, or absolute alcohol as it is called, is made up of three chemical constituents combined together in fixed proportions ; namely, carbon, hydrogen, and oxygen. These three substances are described as elements, for the reason that they cannot be analysed into anything else. The minutest portion of any element that can be conceived of is the atom, which is indivisible. The atom is quite an imaginary quantity, and has no separate existence, but its relative weight and volume in different substances are known. The curious law in chemistry holds good universally, that simple elements as well as compound substances combine with one another only when certain fixed proportions of each are taken. These fixed proportions are usually referred to as "combining weights," the precise meaning of which can only be explained to those who have made some progress in the study of chemistry.

Now, if two atoms of carbon and five of hydrogen be combined, we get what is called *ethyl*, and this *ethyl* is the basis of alcohol. To make alcohol we require one part of ethyl and one part of water. The elements of water are hydrogen and oxygen, one atom of the latter and two of the former being combined.

We may, then, represent *ethyl* by the formula—

CCHHHHH, or C_2H_5,

and water by—

HHO, or H_2O.

Adding these together, we get—

CCHHHHHHHO, or C_2H_7O.

These chemical combinations are effected by a displacement of some part of one or other of the constituents, that is, the combining quantity of ethyl displaces one atom of the hydrogen of the water; hence we arrive at C_2H_6O, which represents ethylic alcohol.

Thus ethylic alcohol consists of—

Two atoms of carbon;
Six atoms of hydrogen;
One atom of oxygen.

Carbon may be described as a kind of soot, and oxygen is the vitalising element of the air we breathe, being mixed with about four times as much nitrogen in our atmosphere.

Hydrogen, which is the main constituent of coal gas, is fourteen-and-a-half times lighter than air. It is for this reason that it is used for filling balloons; for as the balloon, when filled with hydrogen, is

much lighter than the same volume of air, it rises, on the same principle that a cork floats on water, than which it weighs much less.

The combining quantities of chemical elements in general differ in weight. Carbon being very much heavier than hydrogen or oxygen, it will be easily understood that those alcohols which contain a higher proportion of carbon are heavier than the others which contain less carbon. We shall not need to consider these in detail, as they are supposed not to be used for drinking purposes; but as there are one or two of them that are occasionally utilised by unscrupulous persons for the purpose of adulteration, we will give a brief description of them.

Methyl Alcohol.

But before doing this, mention must be made of an alcohol lighter than ordinary ethylic alcohol. This is wood spirit or methylic alcohol. It is obtained by distillation from wood. Being cheap, and burning without smoke, it is used largely in spirit lamps. Its chemical formula is CH_4O, from which it will be seen that it has less carbon than the spirit of wine. When tasted it produces a burning sensation, but not quite to the extent that ethylic alcohol does. It seems to produce intoxication more quickly than ordinary spirit, for, being lighter, it is diffused more rapidly through the nervous centres, but the intoxication caused by it soon passes off.

Heavy Alcohols.

The heavier alcohols are those which contain a larger proportion of carbon than is the case with spirits of wine or ethylic alcohol. The product of the first distillation is called "crude spirit." When this is again distilled a lighter spirit may be collected, which, however, is an operation requiring considerable skill in chemistry. The quality of the spirit may be ascertained by burning it. It must be explained that combustion or burning is in reality the combination of the carbon and the hydrogen with the oxygen, so that combustion is in fact oxidation. Our fire in the grate burns in consequence of the combination of the carbon and hydrogen in the coal with oxygen from the air. The carbon and oxygen pass off as carbonic acid gas, more accurately called carbon dioxide, since it has in it two atoms of oxygen to one of carbon (CO_2), and the hydrogen and oxygen escape in the form of watery vapour. Now, if there be more carbon in the burning substance than can be provided with oxygen, the surplus carbon will be deposited as soot. This explains why chimneys require sweeping. The heavier alcohols, similarly, have too much carbon for perfect combustion; hence soot is deposited, and where this is the case we know that we have a spirit heavier and cruder than the ethylic form. As in the case of coal, the hydrogen of the burning alcohol in combining with oxygen forms water (H_2O). Hence when we burn alcohol it is resolved into carbonic acid

gas and water, and if any of the carbon is left over it is deposited as soot.

The next heaviest alcohol to ethylic is that which has three atoms of carbon, and is called propylic. It produces intoxication of a very serious type. That form of alcohol which contains four atoms of carbon is called butylic. It may be obtained by distilling the fermentation of treacle or molasses. When taken into the body it soon induces a feeling of cold with muscular trembling—similarly with amylic alcohol, the last of the series that we need refer to, and which is got from potatoes or molasses. These heavier alcohols are unfortunately often mixed with whiskey, and their continuous use may lead to very serious consequences. Upon such matters, however, we shall have more to say when we come to deal with adulteration.

CHAPTER II.

FERMENTATION.

SINCE all alcoholic liquors contain spirit, it will be well for us to have an idea as to how this spirit is obtained.

Ages ago it was observed that grape-juice, when left exposed to the air, contracted an intoxicating virtue. This was the result, in fact, of what we now call fermentation. Certain invisible germs always floating about in the air lodge upon the grapes and are ready to grow in the sugary juice as soon as the protective grape skin is burst. In wine countries the grapes are crushed in huge shallow vats, called lagars in Portugal, where port wine is made, and this crushing is done by companies of men who tread the fruit with naked feet. To do this with machinery would bruise the seeds and cause them to give out an oil which would spoil the flavour of the wine. The ferment germs then begin to feed on the sugar in the grape juice, a process that we shall describe more fully presently, making spirit as the growth goes on. When the sugar is exhausted the growth stops, the wine being then called "dry." The growth can, however, be arrested while some of the sugar remains.

This is effected by adding brandy to the fermenting liquor, and in this way sweet or "fruity" wine is made. A pint of real port wine contains about—

3½ ounces of alcohol,
24 grains of tartaric acid,
12 grains of acetic acid,
20 grains of mineral matters,
6 grains of ether ;
Water 16 ounces ;
Sugar ½ ounce, often less, which makes heat ;
Albumen 10 grains, a flesh-former.

The only constituents which have the slightest value as food are the last three.

You must not suppose that because God has given us grapes that therefore He made the wine or the spirit that comes from it, although no doubt you have frequently heard intoxicating drink called "a good creature of God." The juice of the grape is one of God's good gifts, but to make wine out of it is in reality to spoil it. Suppose you were to leave a basin of milk for a few days in a warm kitchen, you know it would turn sour, but you would never think of saying that sour milk was one of God's good creatures.

Now that is pretty much what happens in the case of grape-juice. The milk turns sour because of a vegetable growth in it which destroys its sugar ; and the grape-juice, when left standing, has its sugar destroyed by a similar growth, after which the liquid will at once begin to turn sour, owing to the continued generation of acetic acid after all the sugar has been

destroyed. The plants which cause these results are very tiny—you cannot see them with your naked eye; and the process which they carry on is called

FIG. 1A.—Colony of yeast, highly magnified.

fermentation. Engravings are given representing a colony and also a single cell (figs. 1A and 1B) of this curious vegetable growth, in order that those

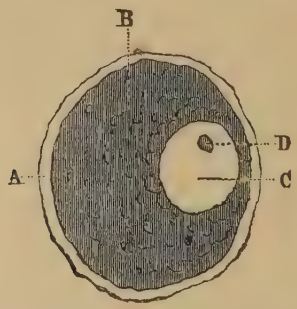

FIG. 1B.— Yeast cell, very highly magnified.

who have never seen it may be able to form some idea of its appearance when highly magnified by the microsope. This species is called the yeast plant, and

is very similar to the natural ferment of wine which is represented at fig. 2. Each plant is a tiny oval, and it multiplies very rapidly into many others. In growing, it gives out certain gases, and it is these gases which make the dough rise and cause the holes that you generally see when you cut up a loaf of bread.

The scientific name of this microscopic plant is rather a long one and not easy to remember. But the meaning of *Saccharomyces* is really sugar-mould or sugar-fungus ; so you will see how very appropriate the name is, since this fungus acts upon the sugar

FIG. 1C.—High yeast, much magnified.

of a sweet fluid, breaking it up into alcohol and carbonic acid. Each little cell is a separate and perfect plant, and in it there are vast numbers of spores, which stand for the seeds of higher plants. If you were to watch a few of these cells in the microscope, you would see each one forming a kind of outgrowth, which soon becomes filled with a portion of the contents of the mother-cell, and is at length separated from it by a cell-wall. This budding continues until a large colony is produced, like the clusters shown in figs. 1A, 1C, and 1D. Pasteur, in his work on " Beer," writes as if there were two kinds of yeast,

which he calls high yeast and low yeast, the one sinking in the fluid, and the other rising in foam to the surface.

FIG. 1D.—Low yeast, much magnified.

The ferment of wine is called *Saccharomyces ellipsoideus*, because it is rather more oval or elliptical in shape than the cells of beer yeast. You will see this better from the more highly magnified cells at *b*. The grape-juice or *must*, as it is called, always contains the spores of various kinds of ferments, and these commence to grow as soon as the *must* is exposed to the air. It is kept rather warm, and this makes the growth more rapid. I will try to simplify the chemistry

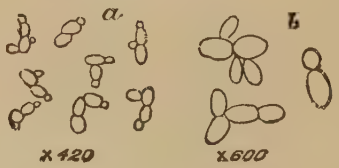

FIG. 2.—The ferment of wine.

of this process. The sugar of grapes is made up of three elements: Carbon, Hydrogen, and Oxygen. The sugar contains twenty-four atomic parts, thus:

$C_6 H_{12} O_6$. This will give, when fermented, Alcohol $C_2 H_6 O$, and Carbonic Acid Gas CO_2. But not all the sugar is thus changed into these two substances; part of it is converted into acid and other things, and is wasted.

Now I must say a word or two about the way in which alcohol is got from other vegetable fluids besides grape-juice. I have already said that any sugary fluid will ferment. But most vegetable substances contain more starch than sugar.

Wheat, barley, potatoes, and many vegetables contain great quantities of starch, and this starch is easily converted into sugar. This is done in malting, a process which will be more fully described later on. The starchy constituents of the barley are converted into sugar by methods which we shall explain hereafter, and from this sugar alcohol is got by fermentation. You now understand how it is that spirit can be got from so many substances. All fruit-juices which already contain sufficient sugar will of themselves, under proper conditions, ferment and produce alcohol. This is especially the case with the juice of the grape. But cane-sugar has to be put through certain processes, and becomes what is called "invert-sugar," which is practically grape-sugar.

Many vegetable substances containing starch are utilised for making spirit by this process of fermentation. All that is required is that they be kept in warm water in which sugar has been dissolved.

Millet-seed in India, the seed of *Poa Abyssinica*, as well as hemp-seed, from the plant which supplies the Arab with his haschish, are commonly used for producing fermented beverages, and there are few countries where some form of such drinks is not known. Very frequently these liquids are highly intoxicating, and sometimes, as in the case of hemp-seed, have other dangerous qualities. Home-made wines in our own country are usually obtained from fruit, but in some lands various kinds of seeds are used. The sugary fluid in which these seeds are kept will set up a fermentation in the starch of the seed before the fluid itself is operated upon to any great extent, and then, if the seeds be removed from the solution, they can be kept a long time without losing the fermenting principle. When a brewing is required they may be again placed in a solution of sugar, and will set up fermentation almost immediately, thus producing a spirituous drink of very great strength. A friend once sent me a quantity of material which he had received from India, and which he had been utilising in this way. On making a few experiments with it, I found that it was millet-seed whose diastase had been set in action; and on once more providing it with a suitable medium, I found I could concoct a drink far more alcoholic than old ale. And my friend was a teetotaler! He believed alcohol was poison. I spared his feelings by not telling him the whole truth, but simply advised him not to use it again. Teetotalers must

not drink everything that is offered to them. At any rate, it is well for us to have our eyes opened to the possible dangers attending the brewing of home-made beverages. It would be a rude awakening to find some day that the liver, or kidneys, or heart had become diseased from alcoholic saturation, although we might for years have remained unconscious that there was anything like alcohol in our supposed innocent "herb-beer," or home-made wine.

Perhaps it will occur to the reader to ask how there can be any such thing as "unfermented wine," if sugary fluids always ferment. It is easy to prevent fermentation. Boiling will do it. Milk in summer is often scalded. Well, that is done for the purpose of preventing fermentation, and milk so treated will keep good for some days. We can also stop fermentation by keeping the sugary fluid from the air. A plug of cotton-wool used for a cork will accomplish this, and with care atmospheric germs may thus be excluded. The Greeks and Turks used, ages ago, to make unfermented wine by boiling the grape-juice, and then keeping it closed in jars. Most of our unfermented wines are got by boiling the grape-juice after it is bottled, and they may be kept good after opening by adding a little salicylic acid. I have sometimes tasted wine of this sort which was very disagreeable, because it was left exposed. On the other hand, I preserved a specimen of unfermented wine, sent me by one of the well-known makers, for a much longer time than would ever be likely to be necessary in

the ordinary way, and found it sweet and good, and free from spirit to the last.

All vegetable matters will decay or ferment if left exposed to the air. The juice of the grape not only ferments by the growth of the wine fungus, but it will also generate a mould, which is only another minute fungus very similar to the yeast plant. Two illustrations of this are given (fig. 3).

The cells of this fungus vary in form, and the different shapes have received different names. The best-known name is *Saccharomyces mycoderma*, but it is also called *Mycoderma vini* and *Hormiscium vini*. Some of the cells are oval (*a*), others are long or cylindrical (*b*); they grow in lengths like threads, and are found as a coating of mould on fermented fluids. When this "mould" is seen on wine, it is a sign that souring will soon take place. I must now explain what this souring is. It is not the mould that turns the wine sour, but it seems to have something to do with the freer growth of the fungus that produces vinegar, and which is already in the wine. The mould probably prepares a suitable medium for the better nourishment of the vinegar-producing fungus.

FIG. 3.—The "mould" of wine.

The fungus which produces acetic acid, the principal constituent of vinegar, is called *Bacterium aceti* (fig. 4). Any fluid with alcohol in it is liable to be

invaded by this growth. It has the power to change the alcohol into acetic acid, and will at length, when all the alcohol is exhausted, break up the acid into water and carbonic acid. The vinegar ordinarily sold is acetic acid mixed with water, other acids being sometimes used. But wine or beer can be converted into vinegar by this fungous growth, which is practically the continuation of the process of fermentation. Hence common vinegar is largely made from stale beer, by allowing it to produce acetic acid; and the very word "vinegar" is merely the corruption of the French *vin aigre*, meaning "sour wine."

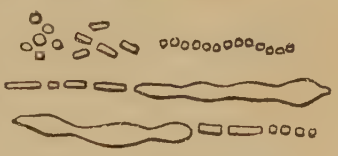

FIG. 4.—*Bacterium aceti.*

You can now grasp the fact that fermentation is nothing more nor less than the decay or breaking up of the grape-juice or sugary fluid in which the process is going on As soon as the grape is burst open the fungus germs in the air, or those which have already lodged on the outside skin of the grape, attack the sweet fluid and eat up its sugar, in order to make alcohol and carbonic acid. Other ferments, like *Bacterium aceti*, act in a similar way upon the alcohol, and when the final stage is reached there is nothing but a sour and useless fluid remaining, destitute of all nutritive qualities. From the beginning of the fermentation to the complete destruction of the acetic acid nothing but decomposition of valuable food materials goes on. The making of

spirit is in reality the destruction of what Nature gives us for food. The grape, sugar, starch, are God's beneficent gifts for our sustenance. If not used, Nature has her methods of clearing them out of the way. They ferment and rot, and their elements are restored to the air for more useful services. Man obtains alcohol by means of these methods; that is, he destroys valuable foods, in order to produce what by Nature's laws becomes mere refuse. He supposes he has found a boon, but it is a blight and a curse. By methods akin to rotting and disease, he arrives at the miserable result of manufacturing what ought to be considered a poison, and in doing so he ruthlessly squanders vast quantities of material that might feed myriads of starving creatures.

In order to prove in a graphic and interesting way that the manufacture of alcohol involves the destruction of useful food, I will describe a simple little experiment which any of my readers can perform. Let a small quantity of spirit be burned. The best way to do this is, of course, to procure a spirit lamp; but it will not matter much how it is done so that the flame is brought within a narrow compass. While the wick of the spirit lamp is burning, invert over it a wide-mouthed glass bottle. If a bell-jar is at hand, this will be the most convenient thing to use. After a while the jar will be covered with moisture, which of course is water. But something else has taken place. The jar becomes filled with a gas that drives out the ordinary air. This is carbonic acid gas, and is quite

invisible. A little lime water put into the jar, however, will reveal its presence, for you will see at once a milky or cloudy appearance in the bottle or jar, and we know that this is exactly what happens when carbonic acid unites with lime ; that is, we have got from alcohol by burning it precisely what is arrived at by leaving it to Nature's operations. So you see alcohol ends in carbonic acid and water, just as grapes do when left to the action of the germs of putrefaction.

The yeast plant is not very different in nature from the small vegetable organisms which are supposed to cause such infectious diseases as small-pox, cholera, and consumption. If you compare the general appearance of the figures given to represent these disease germs, you will perceive at once how similar they are to the yeast plant ; and they are still more like it in their nature and habits. Here is an illustration of the one which is associated with consumption (fig. 5). The spores can be seen in the rods.

FIG. 5.—*Bacillus tuberculosis.*

The likeness of these disease germs to the yeast plant can be better detected when we examine those of a more or less spherical form, called generally

micrococcus, or little seed. Three different kinds of these are shown in fig. 6. The one marked *a* is the microbe of small-pox, that marked *b* sets up a sort of fermentation in animal fluid excretions, and the one marked *c* is associated with a disease which attacks silk-worms.

FIG. 6.—(*a*) *Micrococcus vaccinæ*; (*b*) *M. ureæ*; (*c*) *M. ovatus.*

The virulent wool-sorters' disease, which attacks both cattle and human beings, is always accompanied by rod-shaped microbes called *Bacillus anthracis* (fig. 7). The small oval bodies are the spores, the development of which can be traced by observing each figure in the order of size, until, in

FIG. 7.—*Bacillus anthracis.*

the longest, the perfect cells are seen containing spores.

Very similar in shape, though apparently not connected with disease, is the organism known as *Bacillus subtilis* (fig. 8). It is found wherever hay is kept in warm water.

Many of these germs and microbes are neither spherical nor rod-shaped. Some are oval in form, the best known of which is commonly called *Bacterium termo* (fig. 9). Though this is not a very definite name, yet it will do for our present purpose. The figures lettered *a* and *b* are magnified 650 times, and the others 4000 times. This organism is specially associated with the decay of animal and vegetable substances, and is often referred to as the "ferment of decay."

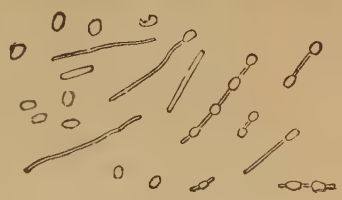

FIG. 8.—*Bacillus subtilis.*

FIG. 9.—*Bacterium termo.*

Still others are of spiral form, and are called *Spirillum*, the example given at fig. 10 being *S. rugula*. It is found in bog water which is full of decaying vegetable matter.

Although there are such differences in form among these minute vegetable organisms, yet in general structure and in their vital processes they all agree, as they do with the various kinds of yeast fungus. We are not far from the mark, therefore, in saying that the fermentation which is necessary

in order to produce spirit is a sort of rotting, and is akin to disease.

The spores which these tiny plants produce at certain stages of their growth being extremely minute, float away into the atmosphere when liberated. Here they are wafted about by the wind, or are deposited on any exposed surface or fluid, where they set up fermentation, if the conditions are favourable, by the growth of new colonies.

FIG. 10.—*Spirillum rugula.*

Now, as alcohol is produced by the growth and action of microscopic plants akin to the fungi of disease and putrefaction, it will be perceived at once that, whatever form it may assume, and from whatever substances it has been obtained, it has one origin. It arises from the destruction of sugar. It is not made by the Creator for man's sustenance, but it is the product of decay, it is the result of destroying food. "Nature," says a well-known writer, "never forms spirituous liquors, she rots the grape upon the branch; but it is art which converts the juice into wine." Some of the uses to which alcohol is put may justify its production in small quantities, but it is a perilous thing to introduce it into a healthy human body.

CHAPTER III.

DISTILLATION.

HAVING explained how fermentation acts in producing spirit, we now pass on to describe how this spirit may be collected. The process is pretty much the same for all fermenting fluids. In these sugary liquids the ferment fungus will continue to grow as long as there is sufficient sugar left for it to feed upon, and then the remaining fluid will turn sour. While fermentation is going on the spirit continues to form and has to be captured. This is effected by what is called distillation.

This process may be most easily explained by means of a simple experiment with water. The accompanying figure (fig. 11) represents an apparatus used by chemists for distilling water. The glass bulb at the end is filled with water, and underneath it a spirit lamp is burning. Soon the water will boil, and steam will travel down the tube. By applying a stream of cold water to the middle of the tube the steam within is at once condensed, and trickles down into the flask *g*.

Precisely the same principle holds good in the distillery, and the experiment shows exactly how

spirit or alcohol is manufactured, though of course on a very much larger scale. In the distillery the retort is represented by a vast wash-still, holding many thousands of gallons, and there is a furnace below it. In order to ensure condensation, the rising vapour is passed through a spiral tube called a worm, shown in miniature in fig. 12. The spirit is conducted through this tube into a vat. After the first distillation, the spirit is

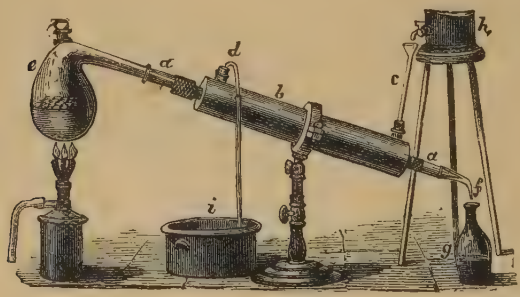

FIG. 11.—Apparatus for distilling.

very impure, and contains a great quantity of fusel oil. A good deal of this is got rid of by redistillation.

As spirit has a great affinity for water, there will be a considerable quantity of this mixed with the spirit, even after repeated distillations. Absolutely pure spirit is only obtained in the laboratory by using quicklime and other chemicals which absorb moisture. What is called "proof spirit" consists of $49\frac{1}{4}$ parts by weight of alcohol and $50\frac{3}{4}$ parts by weight of water. By law gin must not be sold weaker than

35 under proof, and other spirits must not be below 25 under proof. The distiller supplies gin at 17 under proof, brandy 10 under proof, whiskey 10 over proof, and rum 15 over proof.

Theoretically alcohol is made by the distillation of wine, but practically it is manufactured in vast quantities from potato starch and beetroot. Any kind of

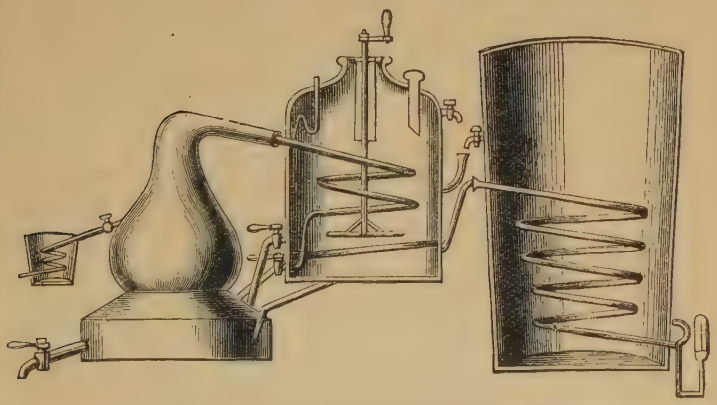

FIG. 12.—"Worm" of distilling apparatus.

starch can be made to yield sugar by acting on it with sulphuric acid; and this, if strong enough, will even bring sugar out of old rags, paper, and wood. When the spirit is produced in this way it is without flavour, and is called "silent spirit." It tells no tales of its origin. But it possesses this great advantage, that it can easily be made into gin, rum, whiskey, or brandy, according to requirements. A few fiery capsicums or juniper berries will give it the flavour

of gin, while a little creasote will furnish the distiller with smoky whiskey. Quite a picturesque example of "circularity" is this production of "silent spirit." The rags make the spirit, and the spirit makes the rags. Let us hope that neither of them is immortal.

Now that we have reached the point at which the alcohol is obtained, we had better try to ascertain what it is worth in comparison with the materials from which it has been produced. We postpone the question of adulteration, and will allow the spirit-drinker to cherish the pleasing delusion that he is imbibing the pure spirit from wine, the essence of the grape, though in thus humouring him we really pay him the poor compliment of supposing him to be very ignorant. However, let us use grape-juice as our example, and inquire what we began with and what we have at the end, when the alcohol is condensed and captured.

In the Bethnal Green Museum there is a very valuable collection of foods, and much useful information concerning the various articles may there be obtained. The following is the analysis there given of one pound of grapes of average quality :—

Water	5600 grains.
Grape-sugar	910 „
Gum and pectose	217 „
Cellulose	140 „
Tartaric acid	56 „
Albumen	49 „
Mineral matter	28 „
	7000 = one pound.

Water we understand pretty well; grape-sugar and albumen are good for food, the latter being much like the white of egg. The gum and the pectose and the rest may be left out of the argument, for they are not nutritive, and they do not affect the spirit in any important way. It is the sugar and the albumen that we are concerned with, for these constitute grapes a valuable food. The albumen has to be destroyed and carefully excluded, otherwise the liquor would not keep. The sugar, as we have seen, is destroyed in fermentation, the whole, except about 6 per cent., being transformed into alcohol and carbonic acid. This 6 per cent. becomes glycerine, cellulose, and succinic acid, none of them of any service as food. It is reckoned that sugar gives about 52 or 53 parts of alcohol to every 100 parts of sugar; that is, the 910 grains of sugar in a pound of grapes will produce about 470 grains of alcohol, only one-fifteenth of the weight with which we began. This alcohol, however, is not food, as we shall show later on; it is only the final product of the destruction of food. The small quantity of sugar which passes over into the spirit is hardly worth taking into account. In an imperial pint of brandy, according to the statistics exhibited at South Kensington, there are only 80 grains of sugar, or little more than the hundredth part of a pound. The wine-drinker gets the advantage of the albumen to the extent of the hundred-and-fiftieth part of the grapes, supposing his wine has any grape-juice at all in it. The spirit-drinker, however, does not

even get this, but only a paltry quantity of sugar, one pound, worth threepence say, in every 100 pounds of grapes fermented and distilled. If spirits were harmless, they would be costly enough. We shall see later on that their costliness involves what is infinitely more precious than money.

CHAPTER IV.

MALTING AND BREWING.

THE objects aimed at in malting and brewing are twofold. First the starch of the barley has to be transformed into sugar, in order that the ferment plant may have something to feed upon, and next, fermentation has to be set up, so that alcohol may be produced.

Malting.

Let us follow the maltster as he goes through the various operations of his craft, and try to ascertain the meaning of each stage as he proceeds. When he has received the barley, which has to be of the finest quality, he soaks it in water for several days, and then spreads it on a floor. The grains, being moist, soon begin to grow. During the process of germination a peculiar substance called "diastase" is formed, and this diastase causes the starch of the barley to change first into a gum-like material and then into sugar. Diastase is produced in the growth of all seeds, it being necessary for their starch to take the form of sugar, in order that it may give nourishment

to the tiny embryo plant within the seed. Starch does not dissolve without boiling; hence it must be altered into soluble sugar, for the plant cannot use it in the solid state. It is a wise provision of nature that starch is thus difficult to dissolve, for otherwise every seed would at once be dissolved by rain, and the young plant could not obtain the nourishment it needs before sprouting out of the seed. But the gradual formation of sugar by the action of the diastase produced by the growth of the embryo plant affords a continuous supply of food.

Diastase is very powerful in its action. At 150 degrees of heat only one part in 500 is formed, but this is sufficient to change 2000 parts of starch into dextrine, or gum, and then into grape-sugar. This diastase can now be purchased, and its effects can be watched when about these proportions are used. The malt-extract of the chemist has a large percentage of diastase in it, and, moreover, possesses most valuable digestive properties.

The maltster allows the barley to continue growing for a fortnight, when little roots make their appearance at the ends of the grains. It is now malt, and some of the starch has been converted into sugar. As soon as the rootlets begin to show themselves, the growth is stopped by drying the malt in a kiln. After a while the malt is screened, in order to sift out the little roots which have dried and shrivelled up under the action of the heat. These little roots are highly nutritious, and if the brewer could use them in his

beer it would be a valuable food. *But his object is not to provide food.* He only desires a spirituous drink that will keep. The beer would not keep long if the rootlets were put into it, for they would rot; and so they are carried off to the cattle.

Brewing.

The brewer then gets the malt at a great price, and crushes it, after which it is placed in a mash-tun filled with hot water. For some hours it is stirred continually by means of machinery. All this time the diastase is converting the starch into gum and sugar, and thus a sweet liquid called "wort" is formed in the mash-tun. The grains are strained away and given to the cow and the pig. Hops are then added, and the liquor is left to ferment just as in the case of grape-juice. But the brewer helps on this fermentation by adding yeast, and the process goes on, the yeast plant continuing to grow at the expense of the sugar, till nearly the whole of the latter is destroyed, and alcohol and carbonic acid gas produced. If the brewer wants pale ale, he will only slightly scorch his malt; if he wants black porter or stout, he will burn his malt almost to a cinder.

The nature of the brewer's operations will be understood by observing the simple apparatus represented in fig. 13. A wide-necked bottle, A, is about half filled with a sugary solution. This may be regarded as a miniature brewer's vat. A little yeast and some ammonium tartrate for the yeast to feed upon are added

to the sugary liquid. If the solution be kept warm, the liquid will soon become cloudy or turbid, and tiny bubbles of gas will begin to rise to the surface. This denotes that fermentation is going on, and the gas, by being passed through certain chemicals in C, can be shown to be carbonic acid, one of the products of fermentation, the other being alcohol. The tube D is filled with a chemical called caustic soda, in order to prevent any impurities from passing backwards from

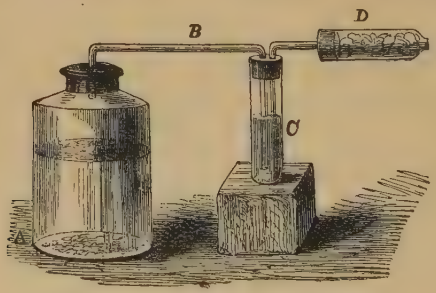

FIG. 13.—Apparatus for fermenting.

the outside air, which would disturb the experiment too much where such small quantities are concerned. The brewer dealing with enormous quantities of liquor need not trouble about matters of this kind.

Generally, however, the brewer does add gypsum, or plaster of Paris, which is, in reality, sulphate of lime, to his water to harden it, in order to prevent too much albumen from dissolving. Albumen is the most nutritious part of the malt, but the brewer only wants to keep enough of it to feed the ferment which is to

produce the spirit. The brewer no doubt tries to fine out the plaster of Paris, but can we be certain that he always accomplishes this? Beer-drinkers ought to look into these things.

The sweet wort when drawn off from the malt is boiled with hops and then poured into the fermenting vat, and yeast is added to hasten the process and prevent other fungous growths. The yeast begins to grow, using up the sugar in the process, while carbonic acid gas and alcohol are produced, in the way already described. In a few days the liquid, laden with spirit, is drawn off and closed up in casks to prevent the air from getting to it, and is now sufficiently robbed of its sugar and its albumen, the only nutritious constituents the malt ever possessed, to be offered for sale to those who are ignorant of its worthless and dangerous character.

To those who have never been through a brewery, it may be interesting to know that such materials as rice, common grain, and other starchy compounds are commonly used in brewing, their starch being converted into sugar by sulphuric acid, a deadly poison, besides which, hops are replaced by cheaper herbs; while chemical powders of various kinds are added, in order to cause "a head," and salt is introduced for the double purpose of bringing out the flavour and stimulating thirst. Worse things even than these are used by the unprincipled, in order to facilitate intoxication, that being the test that too many adopt by which to judge of the quality of their favourite beverage.

Malting and brewing of a primitive kind are very ancient arts. The Egyptians are said to have made a common sort of beer, which they called "bouzy," from Busiris, where their principal god was thought to be buried; and so, you see, we sometimes talk Egyptian when we are playfully describing an unfortunate victim of the public-house. It is thought that the Romans introduced a similar beverage into Britain, before which time our ancestors drank milk, water, and mead. Ale has ever since held its ground among our countrymen. Chaucer celebrated the "mighty ale," and all through the Middle Ages it was the standard drink of the English. Now, enormous buildings are found all over the land, with elaborate machinery, and great boiling-houses, copper-houses, brew-houses, fermenting-houses, and miles of casks and barrels stacked upon canal-banks and railway-sidings, all devoted to this one nefarious industry.

A brief description of one of our large breweries will not be out of place, for not many people have the opportunity of visiting such places. When the malt has been shorn of its rootlets by passing it over wire screens, it is sent through the malt-mill, which consists of two steel rollers, and then by means of a "Jacob's Ladder"—that is, a succession of buckets attached to a revolving band something like a dredging-machine—it is raised to an upper floor, where it is boiled in tanks, made so as to keep the liquid in motion while crushing the malt. This process works up the malt and water into a sort of gruelly liquid in the mash-tun, and

continued until nearly all the sugar is extracted from the malt. The liquid is then run off, and is called "wort," the malt grains being taken away to the pigs, and the wort conveyed into huge coppers, in which it is boiled with hops. All around it are men stirring the compound amid heat and vapour, literally earning their bread by the sweat of their brow. When sufficiently flavoured, the wort is sent into a great wooden vessel called the "hop-back," by which the hops are strained out. The liquid is next poured into wide, shallow tanks to cool—sometimes the cooling is hastened by an after-process with refrigerators. It is then conducted to the fermenting-house, where it lies in great oaken vessels, each capable of holding perhaps a hundred barrels. Yeast is added, and the fermentation is set up. Great skill is required, in order to judge from the appearance of the surface when fermentation has continued long enough. Care also is required, for the bursting bubbles give out great quantities of carbonic acid gas, which, being heavier than air, sinks to the floor and hangs about the bottoms of the vats, and may suffocate any unhappy individual who does not take the necessary precautions. The fermentation is usually finished in separate vessels, but the principle is the same. A head or scum of yeast is left on the surface of the beer, to protect it from the atmosphere, otherwise germs would fall into it and set up fungous growths which would cause acidity. Everything is now ready for storing the beer in casks, which are at once carefully bunged up as a

protection from the air. The yeast is compressed into solid blocks, the pressure and drying arresting growth, without killing the organisms. This material appears after a while as "German yeast," for the use of the baker and the housewife, who have the happiness of getting the only useful product of all these perilous and gigantic labours.

It may be supposed, indeed it is often affirmed, that the beer retains the nutritive qualities of the barley. If what we have said, however, about fermentation be borne in mind, this will be seen to be quite impossible. Suppose we take the brewer's estimate of $2\frac{1}{2}$ bushels of barley for one barrel of beer, or 31 gallons. There are 130 pounds of malt in the $2\frac{1}{2}$ bushels; hence it requires rather more than 5 pounds of barley to make a gallon of beer. Now, what becomes of this 5 pounds or 80 ounces of barley? The malt cooms weigh 20 ounces, the grains 26 ounces, the finings 9 ounces, and the fermenting products 13 ounces, and there are 12 ounces of gum and other materials, making up 80 ounces. The gum is of very little value as a food, and the products of fermentation left in the ale or beer consist of several kinds of acid—namely, acetic (vinegar), lactic (which gives milk its sourness), and succinic—a little glycerine, carbonic acid, resin, tannin, oil of hops, salt, and gypsum, or plaster of Paris, the two latter having been added. There is a very minute modicum of nutrient material here. In a whole gallon there is but a pennyworth of food, whereas the ale will cost two shillings.

Truly the beer-drinker pays heavily for his food. For the same money a dozen good loaves could be purchased; and by spending the money on bread we should help the farmer and his men, the miller, the baker, and the shop-keeper, while we should also save the taxes and rates for the maintenance of the poor, whose poverty is nearly always due to drink, and for the provision of police, the gaol, and the lunatic asylum, which would hardly be necessary but for intemperance. If the whole traffic were swept away, we could afford to support the entire race of brewers and publicans in luxury for the rest of their days, and have a handsome surplus left. But the two shillings spent on beer is thus distributed:—

	s.	*d.*
Cost of barley	0	5
Maltster	0	3
Tax and rates	0	5
Brewer	0	4
Publican	0	5
License	0	1
	1	11

Balance, showing what the consumer gets in his gallon of ale, One Penny!

CHAPTER V.

IS ALCOHOL A FOOD?

THE assertion is often made that alcoholic liquors feed and strengthen the body. We will try to find out if there is any truth in this. We must first ask—

What is Food?

Generally speaking, anything is properly called a food, whether we eat it or drink it, that is capable of being so changed in the body by digestion as to become like the tissues of the body in one or other of its parts, or else to give force to any of the bodily organs so that they can perform their duties more effectively. So you see foods may be regarded as either tissue-makers or force-producers. They may be both, and very often are so, but they must be either flesh-builders or heat-formers if they are to be rightly called foods. The distinction is quite a theoretical one, for all foods which build up the tissues necessarily have a share in imparting to them more or less of vital force. It will help us, however, to make the subject more simple and

intelligible if, in our examination of the nature and offices of food, we follow the usual method of physiologists and consider food-stuffs as being either tissue-formers or heat-producers. The first kind repair the waste which is always going on in the bodily organs, and the second kind assist in the maintenance of animal heat. Tissue-formers are those which contain the chemical substance called nitrogen, and consist chiefly of meat, milk, and bread; and heat-producers are mainly oily and fatty substances, as well as those which contain starch and sugar. Some substances, like salt, pepper, drugs, tea and coffee, though not directly serving the body in making either flesh or heat, yet do assist in digestion, and may therefore be classed among the foods. Now, I hope you will understand what we have to do in order to settle the question as to whether alcohol is a food or not. It must be proved that alcohol either builds up the tissues of the animal frame, or that it begets heat in the body, or else that it aids in the digestion of the food, before it can be accurately called a food.

Alcohol not a Tissue-Maker.

Man's body, says the old Book we all love so well, was formed from the dust of the ground; and science proves this to be the case. By proper experiments it can be demonstrated that every element contained in the human frame occurs also in the earth upon

which we tread. Man, however, requires the mediation of those lowlier organisms which share the earth with him, in order that he may transform the constituents of the soil into the complex structures that make up his body. By a subtle and wondrous chemistry, the grass transmutes the atoms of earth and atmosphere into building material wherewith to construct its fibres and its cells, and then the agency of the browsing animal is required, so that the grass may assume such a form as shall fit it to enter into more intimate connection with man. There are, of course, many vegetables which man can digest, and it is easy to support life with these exclusively, but a great deal of labour would thereby be imposed upon our organs, which, in the case of the flesh-eater, is done for him by the ox or sheep. In both instances, however, the result is the same, for the decaying structures of the human body are built up of the constituents of the earth, with or without other agencies.

It appears, then, that our solid foods are prepared for us by the agency of plants and the lower animals. Meat-eaters, as well as vegetarians, are entirely dependent upon plants for their nourishment, the only difference being that flesh-eaters get their vegetables at second or third hand, after they have passed through the digestive mills of animals. Let us see how plants prepare our nourishment for us. A potato may be taken as a very good example. In growing, the potato, like all plants, save a few microscopic forms,

takes in the carbonic acid of the air, and under the action of sunlight converts it into starch. If a tiny portion of a potato be placed under the microscope, it will be seen to consist very largely of starch.

In fig. 14 are shown a few of the cells, which are so minute that a potato measuring a couple of inches

FIG. 14.—Potato-cells with starch.

in every direction will contain some seventy millions of them ; and these cells contain still smaller bodies, full of starch. It is this starch which constitutes the food of animals. As starch will not dissolve, except the water be hot, potatoes are boiled, and this causes the cell-walls to burst, thus liberating the starch, which then absorbs the water necessary to convert it into sugar. Starch and sugar are made up entirely of carbon, hydrogen, and oxygen. In

this respect they agree with fatty substances and oils. All such foods as these are called non-nitrogenous—that is, they are destitute of nitrogen. Alcohol, as we have seen, is likewise destitute of nitrogen. But animal bodies cannot be built up without nitrogen; hence we find that in most starch-cells there are minute granules of albuminous matter, called aleurone, which contain nitrogen. These granules may be seen in wheat-grains. In flesh food there is a considerable quantity of nitrogen. It would seem, however, that the nitrogen merely takes the place of the wasted tissues of the body which are worn off in burning up the starch into animal force, the non-nitrogenous foods being really the source of animal heat and energy.

We are able to judge with tolerable accuracy what substances are utilised in the body by analysing and weighing the waste materials which are given off from the lungs and skin and in other ways, and by observing what the blood contains. Nothing feeds the body or is used by it in any way save what is conveyed by the blood, and whatever is not used up must be got out of the body, or it would eventually cause disease and death. Now most chemists hold that the derivatives of alcohol—that is, its elements, combined with elements taken from the body—are not found in the blood. When we burn a candle we can collect the soot or carbon, which is, in fact, the unused part of the candle, and we can catch the carbonic acid and water which are derived from the combination of the carbon and hydrogen of the candle with the

oxygen of the air. Just so we can estimate what are the products of the combustion of food in the body. The nitrogen given off from the body depends on the quantity of nitrogenous food eaten, and even labour does not seem to increase it. As the tissues contain much nitrogen, it follows that labour is performed at the expense of nitrogenous food, not the waste of the tissues, for this goes on at about the same rate whether we work or rest. The tissues are the instrument by which force is generated, not the material from which it is derived. The engine is an instrument by which steam is got from coal, and the engine wears away. But it is not the wearing away of the engine that makes steam. So it is not the wearing away of the tissues that gives force: that is derived from the food we eat.

It is from our nitrogenous food, of course, that the tissues are repaired; but alcohol contains no nitrogen, and therefore it can have nothing to do with the building up of the wasting tissues.

"To say that it is 'good for food'
Is simply to repeat
The old Satanic masterpiece
Of lying and deceit."

Is Alcohol a Force-Producer?

Having shown that alcohol is not a tissue-maker, it remains to ask whether it generates force. This is not quite the same question as to inquire whether it gives strength or tone to the body, although it bears

to some extent upon it. What we are now to ask is: Does alcohol undergo such chemical changes in the body as beget heat? Does it take up oxygen after the manner of foods proper, such as the non-nitrogenous fat, starch, and sugar, which supply animal heat, and the nitrogenous flesh-meat, which, to a small extent, is a heat-producer, but chiefly acts in building up the tissues? The answer to this question is not so simple as to the one bearing on the formation of tissue. Three points have to be considered, on each of which scientific men have bestowed a great deal of attention.

1. To what extent is alcohol changed in the body?
2. Does alcohol make fat?
3. Does alcohol produce heat?

1. To what Extent is Alcohol changed in the Body?

Some years ago the celebrated Baron Liebig started the theory that no alcohol left the body in an unaltered condition, but that it was burnt up as food is, and was given out as carbonic acid and water. Even were this true, it would not show total abstinence to be any the less prudent, for he admitted that alcohol was far inferior to fat in creating heat. These views of Liebig were soon brought to the test of scientific examination and found to be inaccurate. Many most careful experiments were performed on animals, the results of which were to show that a

great deal of alcohol was excreted unchanged, and that some of it even remained in the brain and the heart in an unaltered condition. This also has been shown to be the case in several instances where post-mortem examinations of the bodies of drunkards have been made.

The subject was taken up in 1860 by two eminent French scientists—MM. Lallemand and Perrin. They inquired whether any of the derivatives of alcohol were given off from the body or were contained in it. If alcohol is consumed in the body it must form other products, just as a burning candle forms carbonic acid and water. These are called the derivatives of the burning substance. Now, when alcohol is burnt, the carbon and hydrogen elements, after the carbonic acid and water are given off, do not form soot, as the unconsumed carbon of the candle does, but they go on taking up oxygen, and make what are called aldehyde and acetic acid. The French experts searched for these substances in the materials given off from the body and in the body itself, but they never found them, except that a little acetic acid was discovered in the stomach, which they attributed to the action of the alcohol on the gastric juice. Moreover, they also found that a great deal of alcohol was given off from the body in an unaltered state.

Dr. Anstie, however, was led to different conclusions by his experiments. Hence Sir B. W. Richardson has to sum up the controversy thus : " We are driven by the evidence now before us to the certain conclusion

that in the animal body alcohol is decomposed ; that is to say, a certain portion of it is transmutable into new compounds."

But it is clear that some portions of the alcohol are given off from the body in an unaltered state—from the lungs as vapour, through the skin as perspiration, and in other ways, it is continually escaping. You may, in fact, inhale a dose of poison by merely being in the company of a spirit-drinker, unless you take care to let the wind come between him and your divinity. I was once doomed to travel a long distance in a railway carriage with a man whose breath scented the air with alcoholic fumes. Unfortunately it was very cold and windy, and we could not bear to keep the windows open. At one of the stations a gentleman opened the door and was about to enter, but immediately drew back, and, giving a significant sniff, said to me in a low tone as he turned, "I don't take my alcohol at second-hand." He may not have been a teetotaler, but he was certainly wise, and I should have imitated his example but for my bags and traps.

2. Does Alcohol make Fat?

As alcohol does seem to be at least partly oxidised in the body, the question arises as to what becomes of that portion which is thus utilised. Dr. Anstie's idea was that it produced fat. There is a sense in which alcoholic liquors favour the formation of fat, and this is a point on which we shall have something to say hereafter; but this "fatty degeneration" is really a

disease, and arises from the failure of the alcoholised blood to convey waste materials out of the body. This is the true explanation of the well-known fact that those who drink ale and beer usually become fat, and also of the fattening of calves by mixing gin with their food. It is a disease, not a healthy process of nature. Spirit-drinkers who do not mix sugar with their beverage are usually thin—at any rate, they do not become fatter. Alcohol evidently acts differently on different persons in this respect, but it is safe to conclude, with Richardson, that it does not produce fat "except by an indirect and injurious interference with the natural processes" ("Cantor Lectures," iv.).

3. Is Alcohol a Heat-Producer?

If alcohol directly, and as a natural process, produced fat, it would of course be a heat-producer. Nothing is more clearly demonstrated than that the combustion of fatty and starchy foods develops animal heat and keeps up the temperature of the body. But all experimenters agree that alcohol does not raise the temperature of the body, and that the final result of its use is to reduce animal heat considerably. There seems to be a certain limit within which the blood can absorb alcohol and decompose it. When that limit is reached, no further oxidation goes on, but the alcohol, unchanged, lodges in the vital organs, or else is excreted from the body. And that portion which is changed when it reaches the minute blood-vessels is transformed, as we learn from the "Cantor Lectures,"

"not into carbonic acid and water, as though it were burned, but into a new, soluble, chemical substance, probably aldehyde, which returns by the veins into the great channels of the circulation." We have, then, only to deal with that portion of the alcohol which the blood can absorb, and in regard to this there is no doubt at first a slight and temporary rise in temperature when alcohol is taken. This, however, has nothing to do with the actual combustion of alcohol, as I shall show in a moment. It is put beyond doubt by the many observations of Drs. Parkes, Hammond, Richardson, and others, that the body is robbed of its heat by alcohol. Whatever oxygen it utilises in its own combustion is diverted from more useful purposes and combinations. After the first stage of alcoholic excitement, a feeling of chill at once arises, and this becomes by continued excess positively dangerous. As the heat of the body diminishes, the products of combustion likewise become less. The carbonic acid breathed out is reduced in quantity. Dr. Edward Smith carefully measured the carbonic acid given out from the lungs of several intemperate persons, and found it to be somewhat less than it ought to have been. Consequently it seems that the combustion of alcohol is carried on by oxygen which ought to be utilised for the natural processes by which the heat of the body is sustained. Alcohol, then, is not a true heat-producer.

They, therefore, who drink ale or spirits "to keep out the cold" are evidently under a complete delusion,

and are acting in direct opposition to all the scientific facts and conditions involved. Alcohol not only does not keep the cold out, but it positively lets out the heat. At first, it is true, there is a sense of warmth, a kind of tingling, when alcoholic drinks have been imbibed, but it is in reality the passage of the heat of the body through the skin that causes this tingling. This escape of heat may go on until the drinker even shivers with cold. What a mistake it is, then, to suppose that alcoholic beverages increase the warmth of the body, or that they are of any service in protecting against the severities of the weather! We have been told again and again how total abstainers in Arctic regions can endure far longer exposure to the frost than those who use even a moderate quantity of alcoholic liquors, and it has now become almost the rule to take only abstainers on polar expeditions.

Science and experience both agree that alcohol is not a heat-giver; and as we have already seen that it is not a tissue-former, we conclude that, as Sir B. W. Richardson pithily puts it, "Alcohol cannot, by any ingenuity of excuse for it, be classified amongst the foods of man. It neither supplies matter for construction nor heat. On the contrary, it injures construction, and it reduces temperature."

Food-Stuffs in Alcoholic Beverages.

Alcoholic liquors, as commonly used, contain other things besides alcohol or spirit. All I have made out

so far is that this spirit is not a food. I must now try to explain to what extent there are food-stuffs in wine, beer, or spirituous liquors. There are certainly small quantities of nutritive materials in these beverages, but they are so very minute in proportion to the whole as to be hardly worth consideration. They could be procured much more easily, at a far less cost.

This subject has already been referred to briefly, but it will not be amiss to bring together the whole facts of the case, and state them in a somewhat different way. In regard to ardent spirits, I have pointed out that they consist of alcohol and water with various adulterations of a harmful and often dangerous character. Wines are very similar in their composition, but have much less alcohol in them. There is a little sugar and flesh-forming material, with gum, starch, tartaric acid, and mineral matter. The rest is water. Only the first two of these substances deserve to be called food, and the quantity of them, even in wine made from nothing but grapes, is quite insignificant.

In a pint of wine, six parts out of seven would be water, and the albumen and sugar together would weigh only about 65 grains in ordinary wine—that is, one-sixth of an ounce, or about the one-hundred-and-fiftieth part of the whole. You see, then, that in regard to common wine, if you spend one hundred and fifty shillings on it, you get only one shilling's worth of food.

The same may be said of malt liquors. They

contain no appreciable proportion of nutritive materials.

The malt, as we have seen, is made from barley, but in such a way as to rob it of nearly all its nutritive qualities. Throughout the operations of malting and brewing the idea is not to make food, but to produce an intoxicant. The maltster does not seek to give you his nutritious barley, but only to bring about the formation of *diastase*, which has the power to change starch into sugar. The brewer has no wish whatever to bestow the sugar upon his customers, but merely wants the ferment plant to feed upon it, so that alcohol may be produced. What, then, is the net result, and how much real food does the publican supply when he deals out his ale or beer over the counter? Well, of course water constitutes the bulk of the contents of the foaming tankard, and to this no one need object. Then about a fiftieth of the liquor, or perhaps more, will consist of alcohol, which you know is not a food at all. And a still less proportion—in some cases as little as a thousandth part of the whole—will be made up of what we may allow to be food. In the mixture there may also be a number of earthy materials more or less harmful, such as plaster of Paris, some acid, a little tannin, used in making leather, with perhaps a drug or two for the purpose of giving "headiness" to the drink—that is, helping on intoxication.

If ever there was a gigantic delusion in this world, surely it is one to suppose that alcoholic liquors feed

and strengthen the body. Why, a glass of ale is, in reality, very little more than a glass of coloured water with a dash of poison in it. What a strange fatality to call this food! To get enough food to support life a man would have to drink daily several hundred quarts of ale. And yet some say strong drink is highly nutritious!

Whatever properties wine or beer may have, therefore, by which the heart of man is made glad, it is put beyond doubt that alcohol is not a food. It neither builds up the body, nor does it generate heat in any direct or useful way. It helps to pull down the wonderfully constructed temple which the soul inhabits, and it expels through the pores that animal heat whose influence upon man's vital powers is of the first importance. Our friends the publicans will pardon the suggestion, then, that they might easily discover a more accurate description of their profession than that which represents them as "Licensed Victuallers."

It is sometimes claimed that though alcohol is not in any true sense a food, yet it economises food and retards the waste of the bodily tissues, so that they do not require the same amount of nutrition they otherwise would. This is denied; but even if it does in a manner prevent the rapid disintegration of tissue, at what a terrible cost it accomplishes this! It saves tissue, at the expense of feeling, thought, life. It deadens the nerves and lowers the whole physical and mental tone. A reptile economises food and saves its

tissues by slumbering all through the barren winter. That is a merciful provision of nature whereby to preserve life for which no adequate provision of food exists. But man is something better than a reptile, and cannot afford to let half his year slip away unused. A locomotive may economise fuel and save its machinery from wear and tear by remaining in the engine-shed; but it is far better on all grounds that it should burn fuel and wear itself away in doing useful work. Tissues are our force generators, and are to be used, not rendered torpid. They are to be transmuted into energy which shall be consumed in the various bodily and mental activities that make up happy and honourable life. He lives most and does most who with a keen and healthy appetite can eat and digest, without artificial and harmful stimulants, a regular and plentiful supply of food, and convert it into sinew and nerve, which he unsparingly expends in doing with his might whatever his hand findeth to do.

But it is far from established that alcohol really does exercise any influence in retarding the waste of animal tissue, doubtful as the advantage of this would be even though it were effected. The ground on which it is supposed that alcoholic drinks lessen the waste of tissues is that less carbonic acid gas is exhaled from the lungs when they are imbibed. But this means only that the blood has been partly robbed of its power to convey the products of waste to the lungs. These effete matters are consequently left in the body to clog the heart, to irritate and inflame the

brain, the liver, and the kidneys, and to set up fatty degeneration and dropsical affections in various parts of the system. Dr. Parkes read a paper before the Royal Society in 1872, in which he gave facts that were decidedly in favour of the view that alcohol does not interfere with the disintegration of tissue. It stupefies and thus prevents thought, and causes a disinclination to muscular effort ; but in no other way does it save tissue. It does not stop the oxidation of the animal tissues, but it raises a barrier against the removal of the waste caused by this process, and hence these waste materials remain in the body to produce plethora and to constitute the seat and sustenance of disease.

But, says the alcoholist, there are other things besides wine and beer which we find necessary to life, though they cannot be called foods. What are they? Salt is one. True, but there is salt in the tissues of the body, and the supply must be kept up. Hence, in a sense, salt may be called food. But there is no alcohol naturally in the body; therefore it is not necessary to introduce any. Condiments, spice, tea and coffee, and such things, are also referred to in the same way ; but all these contain nutrient materials. Mustard and pepper are true stimulants, and restore tone to the stomach; but if used in excess they cause sickness. Every one knows that a strong dose of mustard and water makes a good emetic. But then, all such condiments are confined to the stomach; they do not enter into the circulation as alcohol does, nor

do they affect the heart, liver, or brain. The healthy stomach is better without even a moderate use of them. It is a poor cause which is reduced to arguments based upon such insignificant details. A dog that is so lame that it must be helped over a stile by efforts of this kind cannot be far off death.

CHAPTER VI.

WATER AS FOOD.

AFTER the description just given of what food is, the reader will be prepared to perceive what we mean by saying that

Water is Food.

Everything may be called food which gives nourishment to any part of the body or helps to build it up, or facilitates the vital processes concerned in its growth or health. Several cases have recently come before the public of men who have fasted for very long periods; but these persons drank a great deal of water. It would not be possible to live always on water only, but we could live much longer without solid food than without water, or some kind of fluid.

Now, it is well known that our bodies are three-fourths water. Our muscles, which chiefly make up what we call our flesh, or what in meat would be called the lean part, contain exactly that proportion of water. Even bone, hard as it is, has ten parts of water in every hundred; while the brain actually contains no less than eighty parts of water in every

hundred. So it seems we are all afflicted more or less with water on the brain. A very curious illustration of what I am now saying was given some time ago by Sir B. W. Richardson. He carefully weighed the mummy of a man who, he supposed, would, when he was alive, have weighed about 130 lbs., and he found that it was now only 16 lbs. All the water had dried up, and the solid portion which remained was one-eighth of what it was in the living state. This shows how large and important a share of our bodies must be built up by water.

The water in our bodies is always running, and very much of it runs away, or at least escapes in various ways. The blood, as you might suppose, consists largely of water, and it is continually coursing its way through the heart and lungs to the very extremities of the body. In doing this it carries food to every part, and deposits it just where it is needed. But, besides this continuous flowing or circulation of the blood, there is a constant loss of bodily fluid by perspiration, as well as from the lungs, and in other ways. It is estimated that a full-grown man will by these means give out about 5 lbs. of water every day. A great deal of this is passed out through the skin. If a section of skin, perpendicular to the surface, be magnified, it will present the following features, shown in fig. 15: *a*, scarf-skin, which is constantly being thrown off; *b*, true skin; *c*, small fat-clusters; *d*, papillæ, or pimples; *e*, sweat-glands; and *f*, sweat-ducts, or pores. Through these pores vapours from

the warm blood are always escaping, and when they come into contact with the cold air outside these vapours condense and cling to the body in the form of sweat. These pores, or tubes, are very tiny. There are two or three thousand of them in a square inch of the palm of the hand. When examined with the microscope they are found to coil up at the inner end, and are interlaced with a network of very fine blood-vessels called capillaries. The structure of the kidneys is very similar. As the blood is always warm, you can imagine how great is the loss of fluid caused by this continuous evaporation. When the blood is heated by violent exercise or otherwise, the loss is, of course, very much greater. You can now understand how important it is to keep the skin clean and the pores free from obstructions. Should they become blocked up, the kidneys have extra work thrown upon them, and they may break down under the strain. I hope you now have a clear idea of this vast water drainage which is always going on in your bodies.

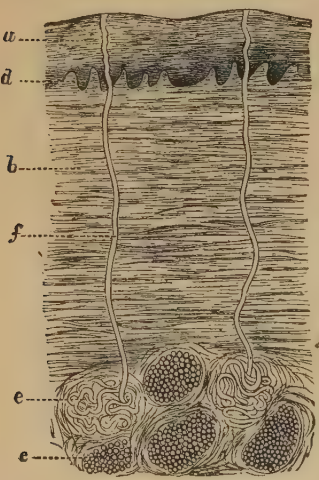

FIG. 15.—Section of human skin.

The quantity of water that we ought to drink every day, in order to repair waste and to keep these vital processes in proper action, will, of course, depend on circumstances. The weather, the amount of exercise you take, and the kind of food you eat must be taken into account. But in the ordinary way a full-grown man will require about a pint and a half or two pints, but young people a little less.

It must be remembered that a great deal of water is taken into the system besides that which we actually drink. In every kind of food there is a large proportion of water. Beef contains over 70 parts of water in every 100, fish 78 parts, bread 38, rice 12, potatoes 75, and cabbage as much as 92 parts. The skin takes in water as well as lets it out. If you were to remain in a warm bath for half an hour your skin would absorb more than an ounce of water, and in smaller quantities it is always taking in a little from the moisture of the atmosphere. It has even been said that persons who could not eat have been kept alive by being often put into a bath of milk.

If a bit of glue, which is of animal origin, be boiled in water, a jelly will be formed. The glue has taken up into its structure a considerable quantity of the water. Just so do our bodily tissues take up water. Besides this, we have to supply fresh saliva, gastric juice, bile, pancreatic and other juices, to replace what we have used up. Then also certain salts in water are carried into the blood, and these are necessary to the proper performance of its duties. Water has the very

valuable property of being able to hold in a state of solution various substances that are essential to life and health. Certain gases, for instance, in water make it pleasant to the taste, and useful solid materials are taken up by it to make the gastric and other fluids without which the body could not be fed.

It is very common to charge bottled drinks with carbonic acid gas, which is forced into the water by pressure. Water holds naturally as much of the gas as will occupy its own volume, but more than this will be absorbed under pressure, and the excess will rush out when the pressure is taken away. That is why the cork from a lemonade bottle will fly out with a report. This gas has a sharp taste, and so is often put into wines, beers, and mineral and other waters to make them agreeable. The gas enters into combination with lime, and gives a greater solvent power to water than it otherwise would have. If there is much lime in the water it is called hard water. The form in which lime occurs in hard water is called carbonate of lime or salts of lime. You can tell when water is hard by its curdling the soap when you wash your hands. Take a little quicklime and drop it into a glass of water. If you put your finger into the water it will feel warm. Now breathe into it for some time. You will see it is changing into a milky appearance. You have, in reality, breathed carbonic acid into it, and this has caused the formation of carbonate of lime. The hard, limy particles which are objectionable in water are thrown down, or,

as chemists would say, precipitated. So that within certain limits waters that have carbonic acid in them are good for drinking, inasmuch as any excess of lime that might be in the water would be corrected by the carbon dioxide.

Water is never found in nature impregnated with alcohol; indeed, there is practically no alcohol in nature. Everything that we are acquainted with can be reduced to some seventy elements which cannot be further analysed. Among all the endless variety of combinations which these seventy elements enter into with one another, that particular combination which constitutes alcohol is absent from nature, save in minute quantities and in an irregular sort of way. On the other hand, nature provides us with a bountiful supply of non-alcoholic beverages, such as water, milk, and vegetable juices.

Then, again, as animal bodies are seen to consist of the same elements as are found in nature, and as alcohol occurs in nature only in minute proportions, and under exceptional or abnormal conditions, it is clear that alcohol cannot be a natural beverage. It does not contain nitrogen, which is essential to the repair of animal tissues, and whatever useful services are rendered by fluids are abundantly provided for by nature, without the presence of any fermentative or alcoholic constituent. Moreover, the fact that there is nothing in the composition of the human body that demands different nutritive elements from those which give to the lower animals their vast strength and their

wonderful powers of endurance, demonstrates that man has no need of any other beverages than those which such animals consume. This is borne out by those cases in which whole tribes (as, for instance, the various Mohammedan nations) abstain from intoxicating drinks, and yet enjoy great physical vigour, as well as attain to considerable intellectual excellence.

There can be no doubt that water is a good and safe kind of drink when it is pure. For protection, and to gratify the palate, we may mix it with tea, coffee, or cocoa, and these, within limits, are nutritious and beneficial for most people; but water by itself, under proper conditions, is all that is really necessary for perfect health.

Animals drink nothing but water as a rule, after they are old enough to do without milk. The bird's swiftness, the lion's strength, the dog's agility, the horse's stay, are all maintained upon water. Samson, Daniel, and John the Baptist are all types of manly vigour and health ; and they drank only water. In the heat of India and Africa, Havelock and Livingstone found they could sustain the fatigue of their toilsome marches far better by drinking non-alcoholics, and Arctic explorers testify that extreme cold is borne with less discomfort and peril by abstainers than by those who use spirituous liquors. When pure, there is nothing safer or better than water. And where it is suspected, it can easily be purified by filtering. Where the water is of a doubtful character it should

be boiled. A bit of toasted bread will give it a pleasant flavour. At those times when tea or such beverages are not ordinarily used, it is wisest and safest to drink nothing but water. It has virtues that no other fluid possesses, and is free from those disadvantages that even tea and coffee are not altogether without.

"Oh, fair is the virgin lymph, fresh from the fountain,
Sleeping in crystal wells,
Leaping in shady dells,
Or issuing clear from the womb of the mountain,
Sky-mated, related, Earth's holiest Daughter!
Not the hot kiss of wine
Is half so divine
As the sip of thy lip, inspiring Cold Water!'

CHAPTER VII.

ACTION OF ALCOHOL ON FOOD.

THE human body may be described as the most wonderful house ever constructed. It was not built of wood and stone, but of materials far more remarkable. It contains many apartments, each having its own special use and adorned with objects of beauty and usefulness, that cannot be matched even by the furniture of king's palaces. There is the heart, which pumps for years, without stopping, a living stream of blood to every corner of the body; there is the brain, which is the study where the finest productions of art and poetry are created; there are the blood-vessels, which, like a vast system of pipes, convey nutriment to every organ, and the veins, which carry on the drainage of the whole structure; and there are the stomach and intestines, the liver and the pancreas, with a number of glands and other curious contrivances, all concerned in the repair of the wasting tissues.

I shall have occasion to lead you through many of the compartments of this wonderful house as we go on in our study of the action of alcohol on the bodily

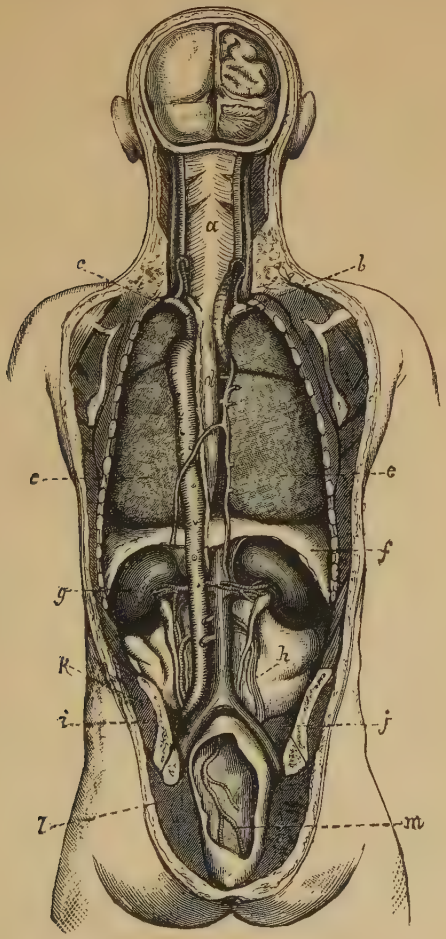

FIG. 16.—Internal organs of human body.

organs. It may, therefore, be as well to place before you a general view of the interior of the body, so that you may be able to carry in your mind the relative size and position of the principal organs to which we shall subsequently have to give attention. The brain is shown partly uncovered, in order to exhibit a portion of the cerebrum at the top, and of the cerebellum below. The lungs (*e*) can easily be distinguished. The heart lies in front of these, and cannot, therefore, be seen. The kidneys (*g*) are represented as protruding at the back, being connected with the bladder (*m*) by long tubes called ureters. The diaphragm (*f*) bounds the lungs below, and two great channels for the blood run up the centre of the figure, and are connected at the top with the heart. The liver lies on the right side of the body, just under the diaphragm, and touching the right kidney, but it is represented as enswathed in its membrane. For a similar reason, the stomach, intestines, and pancreas are not visible ; but diagrams of these and other internal organs will be shown later on.

We will first look at that part of this wonderful fabric which is concerned with the digestion of food.

The Saliva.

While solid food is being chewed it is mixed with saliva, which not only softens it so that we can swallow it more easily, but also sets up a very important chemical action upon it. There is a substance in the saliva called *ptyalin* (pronounced *ti-a-lin*), which is

very much like the *diastase* previously referred to as changing starch into sugary gum. This *ptyalin* acts on the starchy portions of the food, and keeps up that action even after the food is swallowed. The saliva comes out of the blood, and passes into the mouth through three pairs of glands, situated in the cheeks and under the tongue.

FIG. 17.—Salivary gland.

These glands are very useful and curious organs, and deserve to be described with some detail. Here is a portion of one of them from under the tongue, called the submaxillary gland. It consists of lobes made up of a group of tiny sacs. The lobes are connected together by loose tissue (*a*), and are wrapped up in other tissue. From each lobe is a duct or tube (*b*, *d*). These ducts run into one another and eventually leave

the gland by a larger tube which opens on the mucous membrane of the mouth ; *d* shows the tube lengthways, and *b* a similar tube cut across. These lobes are magnified 425 times; but when the whole gland is looked at it has the appearance of a very small bunch of elderberries lying in tissues of various kinds.

If any of these glands get out of order, a very troublesome kind of indigestion is the result. I may observe, too, that babies have no *ptyalin* in their saliva, so that nature teaches us not to give them starchy food until they are two or three months old. This is often done through ignorance, and no doubt some babies are made ill, or even die, in consequence. There is no starch in milk, and therefore this is the only proper food for very young infants.

Now as to what alcohol does in the way of interfering with the proper action of the saliva. First—

It Dries and Hardens Food.

A piece of meat kept for some time in spirit will look hard and shrunken when taken out. The "flocking" of the white of egg, when mixed with wine, is also an illustration of the hardening effect of spirit on albuminous or nitrogenous food. Now, the saliva is intended to soften our food, so it appears that alcohol tends to undo the work of the saliva. You can prove this by a very simple experiment. Put a little flour into two spoons, taking care there is exactly the same quantity in each. Add a little spirit to one of them, and then allow six drops of saliva to fall from the tip

of the tongue into each spoon. After a while you will find that the dough in that spoon in which you placed the spirit is stiffer than in the other case.

It is clear, then, that alcohol hardens flesh-food, and hinders the liquefaction of starchy food, both of which results are unfriendly to digestion. All food has to be turned into liquid before the body can use it, and as alcohol delays this process, it must do harm. Hence when any one says, what often is said, that a glass of ale helps digestion, he only betrays his ignorance.

Before I leave this point, I should like to impress upon you the importance of chewing thoroughly all food which contains starch, such as bread and potatoes. The common notion is that meat requires most chewing, but that is a mistake. It also should, of course, be well chewed, but starch still more so, in order that the ptyalin may act upon the interior parts of the starch grains. You have noticed how a dog bolts a lump of meat, but crunches up a biscuit. Some of these lower animals are better chemists than many human beings.

Alcohol hardens animal substances by expelling from them the water they contain. The man of science who wants to preserve his zoological specimens keeps them in bottled spirits, and it is common to subject to the action of rectified spirits portions of plants or animal tissues which are mounted on microscopical slides. But who wants his stomach to be a preserving bottle? Can anything be less conducive to perfect digestion than to expel the water from the system, to harden

the chief constituents of our masticated food, and to arrest those changes in the contents of the stomach which are essential to their proper solution? It has been made abundantly clear by men of authority amongst us that food which under ordinary conditions would be digested in three or four hours will remain in the stomach as long as ten or twelve hours in an undigested form if alcohol be present.

CHAPTER VIII.

ACTION OF ALCOHOL IN THE STOMACH.

WHEN the food has been masticated and mixed with saliva, it is swallowed into the stomach. Here it undergoes most important changes. The food-stuff which has not been acted upon by the salivary fluid—that is, all flesh-food—is now subjected to the action of the gastric juice. We will explain how this is done.

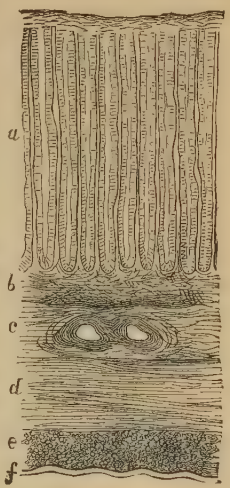

FIG. 18.—Section of stomach.

The stomach is a strong bag, about 10 inches long by 4 inches broad. Its walls are made up of several layers. Fig. 18 gives a view of these layers. Those marked *b*, *c*, *d*, *e*, and *f* are muscular and membranous; but we need not describe these in detail. The one important layer for our present purpose is that marked *a*, the inner coat, or wall, of the stomach. This is crowded with minute orifices connected with

tiny glands which secrete and pour out the gastric juice into the stomach. One of these glands is shown at fig. 19, magnified 100 times, covered with peptic cells, and ending in an orifice through which the gastric fluid flows.

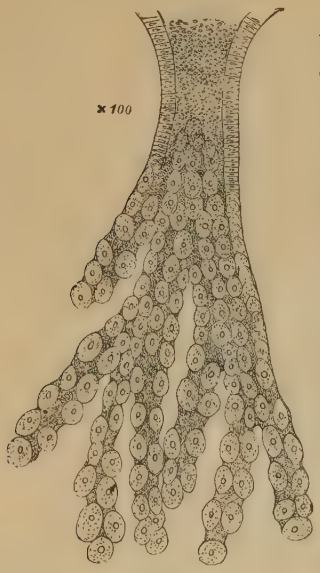

FIG. 19.—Gastric gland.

The gastric juice acts upon the flesh-forming elements of our food just as ptyalin acts on the starch. Flesh-forming foods are principally the lean of meat, white of egg or albumen, cheese, and gluten, or what remains of flour when the starch is dissolved, and are all called by the general name of *proteids*, for chemically they are all alike, differing from fat and starch in containing nitrogen. By a sort of churning, the food in the stomach is constantly turned about, so that every part of it is presented to the action of the gastric juice. Gradually the whole mass becomes liquid or gruelly, and it is then called *peptones*. In this condition it passes through an opening in the stomach, called the *pylorus*, that is, the gatekeeper, and enters the intestines. We will

follow it there presently; but first let us try to find out what is

The Action of Alcohol in the Stomach.

Here again the hardening effect of alcohol is betrayed. The soft peptones tend to become hard, and the work of the gastric juice is undone. If you have ever seen any one drink an egg beaten up in wine, you will have noticed how lumpy or curdled the mixture appears. In my former "times of this ignorance" I have often taken this dose for the sake of my voice, but I find now it is far better to take the egg without the wine. Now what the wine does for the albumen of the egg, alcohol does for the pulpy peptones in the stomach, and so digestion is interfered with. But besides this, alcohol positively destroys the most useful and effective agent concerned in digestion. It begets such chemical changes in the gastric juice that the work of the stomach cannot be punctually and properly performed. Gastric juice, when poured out from the glands in the walls of the stomach, contains an active principle called *pepsin*. When this ingredient comes into contact with alcohol, it is hardened and thrown out of combination with the fluid of the gastric juice. A process similar to the one which went on when you breathed into lime water, and so caused the particles of lime to show themselves, goes on when alcohol and gastric juice come together. The *pepsin* is separated from the fluid, or is, as chemists say, precipitated. Dr. Dundas

Thomson accordingly tells us, "It is a remarkable fact that when alcohol is added to the digestive fluid it produces a white precipitate, so that the fluid is no longer capable of digesting animal or vegetable food."

In a book entitled "Physiological Action of Alcohol," there is an account of a series of experiments carried on under the superintendence of Dr. Monroe, for the purpose of testing this question of the chemical effects of mixing alcohol with gastric juice. Some finely minced meat was put into a number of bottles, to which were added small quantities of gastric juice obtained from the stomach of a calf. Into one of these bottles was poured sufficient alcohol to saturate the contents, another was nearly filled with pale ale, and a third was filled up with pure water. The bottles were moved about pretty much as the stomach moves. After ten hours it was found that the meat on which water had been poured was completely dissolved, while in the other two bottles, into which the spirit and the ale had been put, it was still more or less solid. Clearly, then, alcohol is an enemy to a good digestion, and the best thing it can do for the stomach is to go out of it as soon as possible.

It is now possible for any one to test the accuracy of these statements concerning the interference of alcohol with digestion. There are preparations made and sold from both the gastric juice and the pancreatic fluid. They are usually obtained from the pig. The

animal is kept without food the night before being killed. Its stomach will then furnish a good supply of pepsin, while also the pancreatic principle (zymine) can be got from the duodenum. The reader would be greatly interested and instructed if he would obtain a small quantity of these two substances. The pepsin is supplied in tablets and discs, the zymine in tablets and powder. One grain of the pepsin will digest one thousand grains of albumen. White of egg is a convenient animal food for the experiment. If meat be used it must be finely minced or torn into fibres. The zymine requires five grains of the preparation for a pint of milk, and one grain for an ounce of meat. The results produced by these preparations are most striking, and if carefully observed would furnish many valuable hints as to the proper quantity of food to be eaten, and also what kinds of food are easiest to digest.

Alcohol Injures the Stomach.

But I have another charge to make against alcohol. It even seriously interferes with the stomach itself, and robs the glands of their full power of supplying gastric juice. The stomach-walls of many drunkards have been examined, and they are always found to be inflamed and more or less diseased. If you pour a little brandy on your hand, the skin will immediately become hot and red, but the skin is very hard compared with the delicate membranes of the inside of

the stomach, which will of course be far more sensitive to the inflaming action of alcohol.

Fifty years ago it was shown by the observations of Dr. Beaumont on the stomach of a young man, who was wounded in battle, but who lived for years with an opening in his body, which enabled the interior of the stomach to be examined, that alcohol irritates and at length inflames the membrane of the stomach. Almost before teetotalism was heard of, Dr. Beaumont declared that "water was almost the only fluid that did not lead to inflammation of the mucous membrane; while the free use of ardent spirits, wine, beer, or any of the intoxicating liquors constantly produced morbid changes."

This has been more than confirmed by repeated experiments and observations. It is now well known, by all who know anything about such subjects, that the membranes of the stomach are kept clean and healthy, their blood-vessels are protected against inflammation, and the gastric juice remains pure and effective in its operation, just in proportion as the use of alcohol is avoided. Among the many illustrations of this which might be adduced I can only refer to one. Dr. Lees records the case of a gentleman who was never drunk in his life, but was what would pass for a moderate drinker. "He took a drink in the morning to give him appetite for his breakfast, another dram of bitters before dinner to improve his appetite for it, and another to help to digest it; a glass or two at night for friendship and not to

appear odd in company, and a final glass for a night-cap." The end of it was that he died before his time of cancer in the stomach.

Whatever injures the stomach or hampers it in its work inflicts damage upon all other organs of the body. Shakespeare says the stomach —

> "Is the storehouse and the shop of
> The whole body. True it is
> That it receives the general food at first,
> But all the cranks and offices of man,
> The strongest nerves and small inferior veins,
> From it receive that natural competence
> Whereby they live."

Hence the diseases which spring, directly or indirectly, from intoxicating drink are innumerable, and no doubt multitudes of deaths result from the lowering of vital force consequent upon the continuous use of alcoholic liquors.

When the stomach at different stages of alcoholic excitement is examined with the microscope, which has been done in cases of accident, in post-mortem inquiries, and by experiments with animals, it is found that the evils caused have been in proportion to the extent to which alcohol has been used. First there arises inflammation more or less severe in the delicate walls of the stomach, then ulcers are formed, and blood oozes out from the delicate vessels, the gastric juice being altogether degraded; and, finally, even cancer is caused. Unfortunately, these processes may proceed to a dangerous point before there is any suspicion awakened,

owing to the dulling effect upon the nerves exerted by alcohol, for it is a narcotiser or paralyser like ether and chloroform, though, of course, to a more limited extent. But the evil is there, notwithstanding that its effects are not at first felt. If the walls of the stomach be constantly subjected to the irritating action of alcohol, they will at length give out a slimy secretion instead of pure gastric juice, and ultimately sores will arise, the coating and glands becoming of a dark-red colour, and portions even of the tissues themselves are thrown off in a putrid condition. At this stage, life of course becomes impossible, though the victim may linger for a while in a state of physical and mental torture. The brain shares in the calamity, and breeds the ghostly demons which haunt the drunkard's sleep, and even in his waking hours goad him into frenzy.

CHAPTER IX.

ALCOHOL AND THE FINAL STAGES OF DIGESTION.

Final Stages of Digestion.

I HAVE described the processes of digestion so far as the saliva and gastric juice have any part in them. But this is not the whole of the matter. There are still portions of the food that are not perfectly reduced to a liquid form. The saliva of the mouth has not converted all the starchy materials into sugar, and all this sugar has not yet been dissolved. Moreover, the fatty substances, although broken up, have not been brought into a fit condition to enter the blood. After the peptones have passed from the stomach, they enter into the intestines, the first portion of which is called the *duodenum*, a prolongation of the stomach, and communicating with it through the pylorus or gatekeeper. The *duodenum* is an important organ, for in it is completed the work which the saliva and the gastric fluid were not able to finish, so that we may think of it as a sort of second or subordinate stomach.

In this *duodenum* the undigested portions of the food are acted on by the pancreatic juice, secreted by

a large gland called the *pancreas*, or sweetbread. By the agency of the pancreatic juice the solution of the food is perfected. The pancreas is constructed

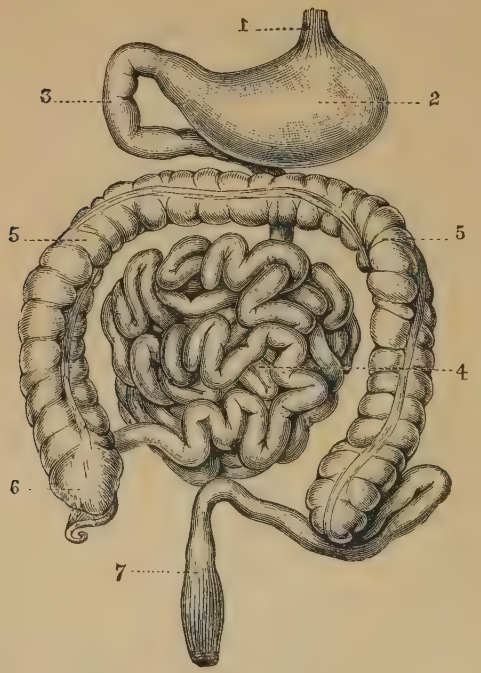

FIG. 20.—Stomach, 2; duodenum, 3; intestines, 4 and 5.

similarly to the salivary glands, of which a view has been given, and it is affected by alcohol precisely as those glands are. Such glands only act, Professor Huxley tells us, under certain favourable nervous con-

ditions. It follows, therefore, that whatever effects are produced by alcohol on the nerves, which we shall presently see are of a very serious kind, these effects will react on the secretion of the pancreatic juice.

Along with the pancreatic juice another fluid, called bile, enters the *duodenum* from the liver; indeed, both these fluids pass into the *duodenum* by a common open-

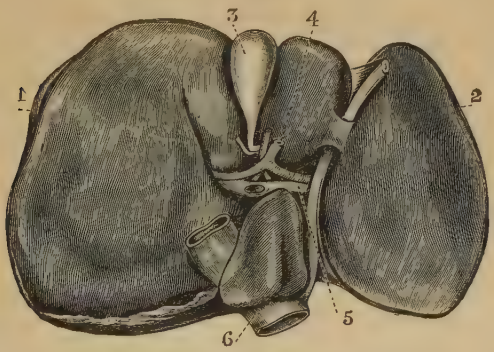

FIG. 21.—Liver, showing gall-bladder (3); portal vein (5); artery (4); vein (6).

ing or duct. The bile seems to act on fat, breaking it up into minute globules, so that they may pass through the very small vessels which convey the fluid food into the body. The liver weighs about four pounds in a healthy man. It takes up all excess of sugary material from the blood, and retains it in an insoluble form called *glycogen*, until it is required, and it also extracts from the blood all waste matter, and turns it into bile. Now alcohol, being fluid, passes on very

quickly to the liver, and hardens its delicate membranes, destroying many of its minute cells, and causing the organ to become hard and knotted. Such a liver is called "hob-nailed," and is common enough among the intemperate. Besides which, the excessive waste in the liver causes an over-production of bile, and makes it thick and dark.

The liver is shown entire at fig. 21, and is supposed to be turned upwards, in order to bring into view the gall-bladder (3), the artery which supplies the liver with blood (4), the portal vein (5), which brings blood from the capillaries of the stomach and intestines, and the great vein which conducts the blood from the liver (6). If a small portion of the liver be examined microscopically, it will be seen to consist of myriads of cells, minute tubes, and blood-vessels of a very intricate appearance. These cells are soon injured, and even destroyed, by alcohol, and then the bile becomes thick, almost like black treacle or tar. Dr. Arthur Newsholme, whose books on Hygiene are the best popular treatises on such subjects that I have seen, says: "The liver, when alcohol is taken immoderately, becomes seriously diseased. In some cases it becomes large and fatty; in others the chronic irritation excites an overgrowth of fibrous tissue between the lobules of the liver, which, gradually shrinking, squeezes the liver-cells and causes them to atrophy, at the same time obstructing the small branches of the portal vein in the substance of the liver. The consequence of this obstruction is that all the organs

from which the portal vein (the vein through which the blood enters the liver) brings blood become overloaded with blood, which is not able to get easily through the liver, and vomiting of blood and dropsy of the abdomen occur at a later period."

Sometimes the structure of the liver will be so injured by alcohol that the practically incurable malady of diabetes will be originated. This disease consists in the formation of an excess of sugar, and, though it involves nervous derangement, yet its worst symptoms are associated with a bad condition of the liver.

Nature tries to cure these evils by enlarging the liver, but that causes serious inconvenience. It is a common practice in some rural districts to mix spirits with the food of poultry, in order to increase the size of the liver, which is regarded by epicures as a delicacy. It is known that coal-heavers and draymen in London are peculiarly subject to enlargement of the liver, owing to their habit of drinking great quantities of porter. Sir B. W. Richardson, in "Diseases of Modern Life," says: "The liver of the confirmed drinker is probably never free from the influence of the poison; it is too often saturated with it. After a time there follows contraction of the membrane, and slow shrinking of the whole mass of the organ in its cellular parts; owing to this the body becomes dropsical in its lower parts, through the obstruction offered to the returning blood by the veins, and death is certain." When we consider the importance of a

healthy liver, and the disorders caused in it by the use of alcoholic liquors, can we any longer put confidence in the old fable that digestion is promoted by a glass of ale or wine? As the wise man said, "Wine is a

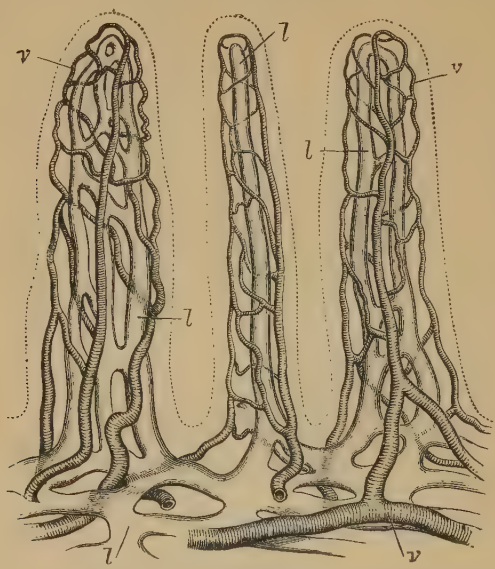

FIG. 22.—Villi, showing capillaries (*v*) and lacteals (*l*).

mocker, and whosoever is deceived thereby is not wise."

I have only now to add that the liquefied food is eventually drawn off from the intestines by an infinite number of tiny vessels called *villi*, which stand upon the coats of the intestines like the pile of velvet.

The indigestible portions are cast out of the intestines without being able to enter into the system. The villi are so minute that a square inch contains about 10,000 of them; and yet so elaborate are they that each one possesses an artery and a vein, interlacing with one another in the same way as do all the capillaries, or minute blood-vessels, as well as a small tube for the reception of the liquid food, furnished with valves to prevent the absorbed fluid from flowing back again into the intestines. The liquid taken up by these myriads of lacteals (as they are called) enters into a common receptacle, and is conveyed by the thoracic duct, which is about as thick as a goose-quill, and lies between the spine and the lungs, to the great chamber on the left side of the neck just under the collar-bone, whence it passes into the general circulation of the blood. Here we shall meet with it, and consider what effects alcohol exerts upon it, when we come to deal with the blood and its vital processes.

Meanwhile we have found that, in regard to the evils inflicted on the digestive organs and processes, the facts of the case are as follows:—

1. Alcohol injures the saliva and undoes its work.
2. It hardens food-stuffs, and delays or prevents their complete digestion.
3. It robs the gastric juice of its virtues, and does harm to the glands which secrete it.
4. It introduces disorder and disease into the liver.
5. It causes an excess of bile, and unfits it for the offices it has to perform.

6. It promotes the waste of much good food that would otherwise have helped to repair the body.
7. It originates many grave perils and diseases that arise from a disordered digestion.

These are not mere fancies, but the verdicts of science, and are arrived at by the long and varied observations of men of the highest skill and most trustworthy character. They deserve the consideration, therefore, of every person who claims to be thought intelligent, and who wishes to put to their best use the bodily and mental powers with which the Creator has endowed him.

CHAPTER X.

ALCOHOL AND THE BREATHING ORGANS.

IN the sense in which water is called a food, air also may be regarded as food. It has already been explained that the blood requires constant replenishment by the digestion and circulation of nutritive materials, and that it must also be charged with oxygen in order that it may properly discharge its functions and build up the various organs of the body. Oxygen, therefore, is food. Without it no part of the body could be repaired, no waste products of animal life could be expelled.

These processes are akin to combustion, or burning. If you place a tumbler over a lighted candle it will burn only for a few seconds. The reason is that not enough oxygen is left in the tumbler to support combustion. The carbon of the candle has taken up some of the oxygen and formed carbonic acid gas (CO_2), the hydrogen in the candle having already seized what it could and turned it into water (H_2O), which floats away as vapour, and not being able to escape condenses on the glass. Now this is precisely what is going on all through our bodies. Various materials are

taking up oxygen, the compounds being either used or driven off in the form of CO_2. This oxidation keeps up animal heat, and thus life is sustained. It can be seen, therefore, how important it is that sufficient oxygen should be conveyed to every part of the system. Let us see how this is secured.

The lungs are the central workshop where the blood gets rid of its burden of poisonous carbonic acid gas, and receives fresh supplies of pure and healthful oxygen. If the diagram of the lungs be looked at (fig. 23), it will be seen that the wide tube, or trachea, running from the throat, divides into two main branches, called bronchi, the seat of the ordinary form of inflammation called bronchitis, and that these bronchi break up into a vast number of smaller branches, called the bronchial tubes. These minuter tubes are swollen out at their extremities, and are practically made up of a number of tiny sacs called air-cells.

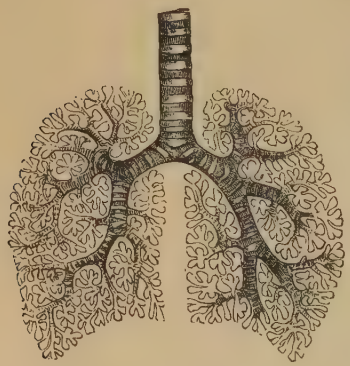

FIG. 23.—The lungs.

The blood, in travelling along the finest twigs of the tree-like lung structure, is brought into contact with the air in these air-sacs, and as everything here is very minute, it is almost as if the whole of the

blood was spread out to the air. From fifteen to twenty times every minute, according to age, a breath is taken, when from twenty to thirty cubic inches of fresh air are drawn in, and of course the same quantity is driven out at every expiration. But there is a great difference between the air inspired and that breathed out. The atmosphere consists mainly of three substances—namely, nitrogen, oxygen, and carbonic acid gas. In every 100 parts of air, 79 are nitrogen and 21 oxygen, the carbonic acid being only about 3 or 4 parts in 10,000. The nitrogen and oxygen are not chemically combined, like the oxygen and hydrogen in water (H_2O), but are mechanically mixed, just as milk and water might be. The oxygen, therefore, can easily be separated from the nitrogen in the lungs without any of those violent results which often attend chemical combinations. Well, when the air enters the lungs, it is, as we have seen, richly laden with oxygen, and almost destitute of carbonic acid. But when it comes out from the lungs it is much poorer in oxygen, and contains a great deal more carbonic acid. Roughly speaking, air which has been breathed has gained 5 per cent. of carbonic acid, and has parted with 5 per cent. of oxygen. It is accompanied, too, with a good deal of watery vapour, as you have no doubt observed when breathing upon a cold surface; and there is also a quantity of animal matter in expired breath. As for the nitrogen, that is breathed in and breathed out with very little alteration. So you see that although the same volume of air is breathed

out that you breathe in, it is of very different composition. The changes caused by the heat of the body are also of some importance, but not for our present purpose. Our business is with oxygen and carbonic acid, the one bringing life to us, the other death.

You can easily demonstrate the presence of carbonic acid in your breath. I have already explained how this gas acts when got by burning spirit and brought into contact with lime water. Now take a little lime water and breathe into it. You will soon see it turn milky in appearance. You have in fact made chalk out of the lime. The lime held in solution in the water has combined with the carbonic acid gas of your breath to produce minute particles of carbonate of lime, which is only another name for chalk. The operation may be thus represented, CaO representing calcium oxide or lime :—

$$CaO + H_2O + CO_2 = CaCO_3 + H_2O ;$$

that is, lime + water + carbonic acid = chalk + water.

You have no doubt performed this experiment by breathing into an empty lemonade bottle which has still retained a portion of the carbonate from which the drink was partly made. The carbonate of lime or chalk thus made cannot dissolve, but floats about in minute particles, and begets the appearance of cloudiness in the lime water or the lemonade bottle.

If you would like to manufacture a little carbonic acid gas in a useful sort of way you can do it by making sherbet. Get some carbonate of soda, tartaric

acid, and castor sugar, and mix them together. When this "sherbet" is put into water it effervesces or "boils." The meaning of this is that the carbonic acid is separated and escapes in an infinite number of tiny bubbles, the bursting of which through the water makes the "fizz." By a little ingenuity you can catch this carbonic acid, but without any ingenuity you can prove that it is there. Take up the tumbler containing the boiling mixture and pretend to pour

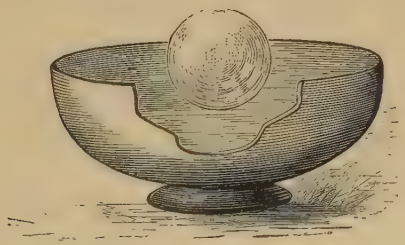

FIG. 24.—Experiment to show the weight of carbonic acid gas.

the contents over a lighted taper, taking care not to tip the tumbler so far as to allow the liquid to escape. Your taper will go out if its flame is not a large one. Apparently you have poured nothing upon it, but in reality you have smothered it with carbonic acid gas, precisely as a candle is put out by your breath.

Perhaps you wonder that the carbonic acid falls on the flame when you tilt the tumbler. Being a gas, you might think it would float upwards. The secret

of it is that carbonic acid gas is heavier than air. It is composed, as you know, of carbon and oxygen, and the atmosphere mainly of nitrogen and oxygen mixed so as to be lighter than carbonic acid gas. A very pretty little experiment can easily be made which will illustrate the heaviness of carbonic acid, and which never fails to create astonishment. A bowl (fig. 24) may be filled with the gas, as just explained, by simply pouring it in. Then a light, hollow, india-rubber ball may be placed in the bowl, and it will not fall to the bottom, but will seem to hang in space. It is really floating on the surface of the gas, which is invisible. A soap-bubble will do this still more perfectly; while the ingenious may blow the bubble with carbonic acid or coal gas, and learn many valuable lessons respecting the weight and the behaviour of different gases.

The contrivances of nature for ensuring to us a good supply of oxygen are very wonderful. Gases always tend to mix with each other; hence the carbonic acid gas breathed out by animals is continually diffusing itself in the atmosphere. This is a most important law, for it enables us to breathe even confined air for a considerable time without fatal effects. It is never wise to do so, of course, but there are occasions when it is almost if not quite unavoidable. So powerful is the effect of carbonic acid gas, that if only one-twenty-fifth of the air consisted of it, life would be destroyed. The breath that we expire ordinarily contains about one-twentieth of carbonic acid gas, and

this, as I have just said, soon diffuses. But a much smaller proportion of this poisonous gas is enough to produce drowsiness and headache. A badly ventilated room soon tells a tale. Very often, when persons go to sleep in a place of worship, the blame does not lie with them, nor with the preacher, but with the man whose duty it is to open the windows. Some day, we trust, people will learn that good air is as necessary as good water.

But nature's chief method of purifying the air is by means of vegetable life. Almost all plants (except fungi) take in through the pores of their leaves the very gas we breathe out, and, converting the carbon into plant-tissue, give out oxygen for the use of animals. And so, by this unceasing circularity, the air is continually being drained of its carbonic acid and supplied with oxygen, while plants and animals are both preserved alive.

It being proved, then, that carbonic acid is given out from the lungs in considerable quantity, it can easily be perceived how important it is that nothing should be introduced into the lungs which might interfere with their proper discharge of this duty. If they cannot get rid of the carbonic acid for us, it will tend to act upon our vitality as we have seen it does on a burning taper. If the oxygen is not properly utilised, the flame of animal life will not burn brightly, and the warmth of the body will decrease.

I shall presently explain how the oxygen is conveyed by the blood to every part of the body;

but just now I am only considering the breathing organs, and the importance of keeping them in healthy exercise. All medical opinion goes to show that the effect of alcohol on the delicate structures of the lungs is to irritate them and render them less fit for the discharge of their functions. Effete matters are not properly burnt up by oxygenation, fatty substances are deposited on the delicate membranes, the minute blood-vessels are distended so as to become gorged with blood, which parts with its heat and renders the lung liable to inflammation. Alcohol is absorbed by the veins of the stomach and carried to the liver, whence it rapidly finds its way to the heart, lungs, brain, and kidneys. In the lungs its action is most pernicious. The strongly smelling breath of the drinker reveals how largely the lungs must be influenced by the alcohol that is absorbed. In Dr. Hargreaves' "Alcohol and Science" there is abundant evidence presented to demonstrate that lung diseases, such as inflammation and consumption, are fostered and intensified by the use of alcoholic drinks, and that the death of the patient is hastened. Dr. N. S. Davis, a hospital physician of Chicago, presented some very remarkable statistics on this point to the American Medical Association. Of 210 cases of lung consumption, 68 were habitual drinkers of alcoholic liquors, 15 of these being drunkards. The second class, containing those who had occasionally used these beverages, numbered 91; while a third class of 51 consisted of abstainers. The average duration of life,

dating from the time when the cough had begun to trouble the patient, was in the case of the first class 19 months, the second class 23 months, while in the case of the abstainers it was 25 months. In all these cases the disease had become rooted, and was therefore practically incurable. But the figures make it abundantly clear that the use of alcoholic beverages predisposes to consumption, and hastens on its fatal climax when the disease is contracted.

CHAPTER XI.

THE CIRCULATION OF THE BLOOD.

THE blood is the life. Ages ago this was believed, but it is only since the chemical and microscopical methods of recent times have been brought to bear upon the matter that it has been understood how profound and significant is the truth which the statement contains. Hear what Professor Huxley says: "The function of the blood is to supply nourishment to, and take away waste matters from, all parts of the body. It is absolutely essential to the life of every part of the body that it should be in such relation with a current of blood that matters can pass freely from the blood to it, and from it to the blood, by transmutation through the walls of the vessels in which the blood is contained." When the Bible does touch upon the laws of nature, we generally find that it anticipates the discoveries of later times.

Circulation of the Blood.

The vital functions of the blood are of the utmost importance to the health and continuance of the body. The veins convey the blood from every part of the

body to the right side of the heart, by which it is pumped into the lungs, there to undergo a process of purification. The lungs are always taking in fresh supplies of oxygen during breathing, giving out at the same time the injurious gases brought there by the blood. By the wonderful system of chambers and vessels the blood in the lungs is subjected to the

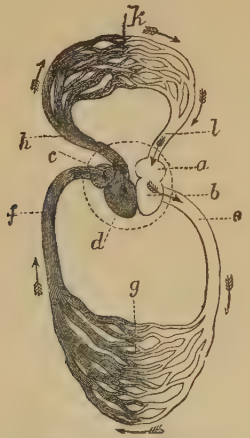

FIG. 25.—Diagram of circulation of blood.

action of the oxygen newly breathed in, and so is prepared again to traverse the body to its remotest parts.

The accompanying diagram (fig. 25) will enable you to form an idea of the course pursued by the blood in circulating through the body. As we are supposed to be looking at the body, the right side of the figure will of course represent the left side of the heart and body. The figure is not an exact drawing of the

circulatory system. To show that would only be confusing. The circulatory system is contracted or drawn in, so to speak, in order to give a more intelligible idea of it. The dotted circle represents the heart with its four chambers inside ; the mass of arteries and veins at *g* is put for the entire assemblage of the blood-vessels of the systemic circulation ; and the smaller mass at *k* for the lungs, or what is usually called the pulmonary circulation, which goes on between the heart and the lungs. The vein-system, bringing back blood to the heart and lungs for purification, is shaded, and the lighter portions of the figure represent the arteries which are concerned in conducting the purified or oxygenated blood from the lungs to the body at large. If, then, we begin at the lungs, *k*, and follow the arrows, we shall see that the pure or arterial blood enters the left side of the heart, *a*, into a chamber at the top called the left auricle. By the contraction of this auricle the blood is forced through a valve into the lower part of the heart called the left ventricle, *b*, from which it is driven on to the various parts of the body, *g*. Having passed through all the minute capillaries, or blood-vessels, scattered in every part of the body, and which we will describe more particularly presently, it has lost its oxygen and become charged with carbonic acid. In this condition it travels on through veins which become more and more broad and thick till the great trunk, *f*, is reached, which is called the *vena cava*. This leads to the right auricle of the heart, *c*.

By a similar action to that which we have stated to have taken place on the left side of the heart, the blood enters the right ventricle, *d*, which pumps it into *h*, a great vessel called the pulmonary artery, and this conducts it into the lungs. After being purified and charged with oxygen in the cells of the lungs, it continues to flow onwards through *l*, called the pulmonary vein, and once more enters the left auricle of the heart, having completed the whole circle of the body.

The Heart.

As only pure or oxygenated blood passes through the left side of the heart, which has to be pumped thence throughout the whole body, this side of the heart is of the most importance ; and the heavier work imposed upon it requires that its structures should be stronger than those of the right side, which act only in concert with the neighbouring lungs. The left ventricle, on which devolves the main labour, is very much thicker than the right ventricle. Fig. 26 gives a view of the left side of a human heart. *L V* is the left ventricle, *L A* the left auricle, and *p a* the pulmonary artery. The ventricle in contracting forces the blood into the great arched vessel, *a o*, called the aorta, from which branches proceed to the entire body. A very beautiful and effective arrangement prevents the blood from returning into the auricle when the ventricle contracts. At *m v* will be seen a system of flaps constituting what is called the mitral valve.

When the ventricle is filling with blood, the edges of these flaps rise upwards, just as the hollow ball does on the surface of the water in a cistern that is being replenished. As the ball rises, the tap which it works gradually closes up, so that by the time the

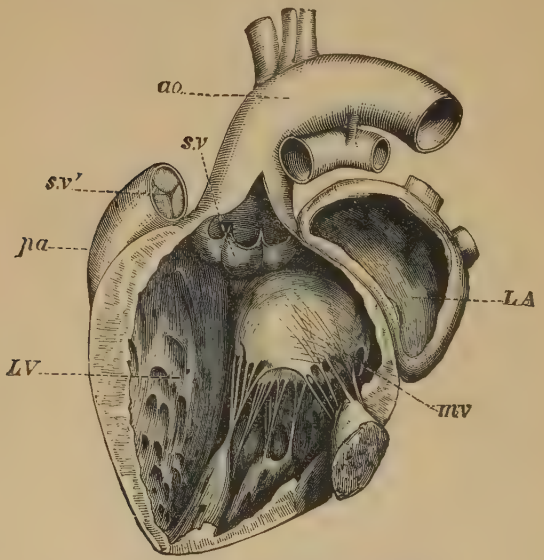

FIG. 26.—Human heart—left side.

cistern is full of water the tube or pipe through which the supply comes is completely stopped, and the water ceases to run. So the edges of the flaps or valves of the heart float upon the surface of the inrushing blood until their edges meet and form a perfect partition between the auricle and the ventricle. The

blood can no longer flow into the ventricle, nor back from it into the auricle ; hence the increasing pressure from above caused by the continued entrance of blood into the auricle propels some of the blood out of the ventricle into the vessels and arteries that are to convey it to the lungs from the right ventricle, or to the body at large from the left ventricle. There is one of these valves on each side of the heart, different somewhat in shape, but both acting on precisely the same principle. Strong ligaments, *t*, bind the flaps to the wall of the ventricle at *c c*, and these are of just sufficient length to allow the edges of the valves to rise to the proper height required, in order that the edges may exactly meet without crumpling or overlapping. By this beautiful arrangement the blood is sent into the aorta and pulmonary artery respectively. Other valves, *s v*, *s v'*, acting somewhat similarly, prevent the blood from returning into the ventricles from the large vessels connected with them. The proper action of these valves is essential to the preservation of life, and we shall see presently how perilous it is to subject them to too great a strain by unduly exciting the heart's action with alcohol.

CHAPTER XII.

ACTION OF ALCOHOL ON THE HEART.

THE heart has necessarily a vast amount of work to do, and this work varies considerably, according to the demands of our life. Even the change from the sitting to the standing posture will add 10 per cent. to its labour. In the case of an adult, the heart beats about 70 times every minute—that is, rather more than 100,000 times daily, which Prof. Helmholtz, who was probably the greatest authority on such matters, calculated was equivalent to raising 122 tons a foot high. No man could easily accomplish that task in 24 hours. This action of the heart goes on through life, the slightest irregularity causing fluttering, palpitation, or faintness. There is no piece of machinery equal to this. Now, the introduction of alcohol into this elaborate mechanism gives rise to very serious disturbances, and adds to the enormous labour of the heart. One pint of ale a day will increase the number of beats by 4,300, and a bottle of sherry 13,000. Whether this increase in the number of beats can be accurately expressed by the weight lifted, as though the increase in beats

meant a corresponding increase in the work done in propelling blood, may be doubted. It is often said that this is so, and the number of extra tons lifted a foot high is stated as representing the extra work imposed upon the heart. It is more likely, however, that the circulation of the blood is impeded, than that it is increased, by alcohol. The expansion of the veins under the influence of alcohol causes the resistance to the heart to be less; hence each beat accomplishes less work. This, however, is a matter of only secondary importance, the injury to the heart by alcohol arising from the fact that it is compelled to beat oftener, since this leads to an abnormal waste of the heart's tissues and an undue strain upon its valves. Like a wearied man struggling under a burden, which at another time he would carry with ease, the heart toils on under the irritating goad till the effect of the dose of alcohol has passed off, and then it relapses into a slower rate of beating and a less powerful stroke.

It would appear, then, that it is by no means wise for persons to fly to brandy when there is anything amiss with the heart. At any rate, this should not be done without skilled medical advice. Many years ago I was acquainted with a church official who was liable to attacks of palpitation of the heart, and who invariably procured brandy as soon as possible. This unfortunate habit frequently exposed him to grave suspicion and misjudgment. On one occasion, not knowing of his affliction, I saw him coming out of a

public-house, and he explained to me that the doctor had ordered him to drink a little brandy at once whenever he felt faint. I was very sorry that a Christian should have to put himself in such a position, because his reasons for doing so would not be understood by everybody. I could not then altogether condemn him, for he evidently believed that he might die suddenly if at such a time he were not able to procure brandy. There are people who always carry a little in their pocket, so as to have it at hand in case of need. I did not know then what I have since learned, that the frequent use of spirits tends to bring on the very danger that the older doctors thought the brandy would avert.

The most frequent form of heart affection is that which arises from valvular derangement, caused either by weakness of the valvular structures or by the deposition of fat about the heart. But even where such defects exist it is possible for the sufferer to live for years if excitement be avoided and alcohol be left alone. Unfortunately, however, too many imagine that the temporary relief which the use of alcohol brings, by driving on the blood which in accumulating has caused unpleasant sensations, is a remedy, whereas it is in reality the overworking of a wearied organ. It helps the heart out of a difficulty, but it leaves it weaker as the result. A relapse ensues, the supposed remedy is applied again, until at length the weakness has got beyond the power of the stimulant, and the heart ceases to act. Alcohol has done its

fatal work. It has reduced the tone of the valvular structures, it has favoured the deposition of fat, and then, when it has reduced the strength of the organs, it lays upon them more than they can endure, and they give up the unequal struggle. There are other evils from which the heart suffers as the result of the use of alcoholic liquors ; but these will be better understood when we have explained the nature of the blood and the action of the blood-vessels.

CHAPTER XIII.

ACTION OF ALCOHOL IN THE BLOOD.

THE office of the blood is to supply the various parts of the body with what is needed to repair them, and to carry away the refuse materials thrown down as the result of the wear and tear constantly going on in the animal organs. It is, then, the universal food-provider, and the scavenger-in-chief for the body. In considering how these offices are performed, we must first understand—

The Composition or Contents of the Blood.

We shall then be in a position to comprehend how the blood gets rid of its waste matters, and in what way it takes up and conveys oxygen to those parts of the body which require it. The most important part of the blood is what are called the corpuscles, or blood-discs (fig. 27). In man they are circular (A); in birds, reptiles, and fishes they are oval (B). Sometimes they adhere together and form long rolls, but frequently they lie singly. Most of them are red, but a few are white, of which two are represented at the top of the figure, the white corpuscles being slightly larger than

the red. These corpuscles are so small as to require a very good microscope to see them. It is calculated that seventy thousand millions of them would not fill more than a cubic inch of space. In the picture they are magnified 1000 times. When lying in a roll, twelve thousand would measure only an inch, so you see they are exceedingly minute. Hence they can easily pass through the most delicate vessels of the body, and they present a large amount of surface, in combination, to the various gases which act upon them. Well, the blood coming into the lungs from the right side of the heart is purplish from the presence of carbonic acid gas, but under the action of the oxygen it turns bright red, and leaves the lungs to re-enter the heart at the left side, from which it is pumped into the arteries and courses its way into every part of the body. It is the changes in these minute corpuscles which explain the differences in the colour of the blood before and after its passage through the lungs. Nothing can be clearer, therefore, than that whatever affects these blood-corpuscles, for good or ill, equally affects the life and growth and welfare of every organ of the human frame.

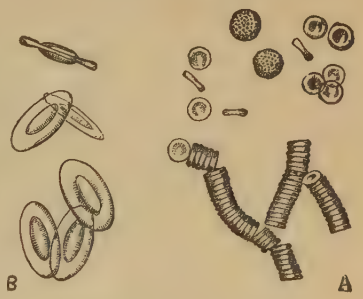

FIG. 27.—Blood-corpuscles.

It is supposed that the red corpuscles are developed

from the white ones in some way, but they are nevertheless far more numerous. The white corpuscles, however, are of importance for a further reason. A well-known Russian scientist has shown that some of them, which are larger than the rest, positively destroy foreign matters, and even disease germs, which may get into the blood, and so prevent sickness and perhaps death itself. There is also in the blood a substance called fibrin, and it is the clotting of this which stops the flow of blood from a wound and helps it to heal. Where there is a deficiency of fibrin, there is more likelihood of the person bleeding to death. And always when the fibrin is not of the right quality there will originate disease of some kind or other.

Action of Alcohol on the Blood.

It was necessary to give this brief account of the nature of the blood, and the manner of its circulation through the body, in order to explain the effects of alcohol upon it, and, through it, upon the entire body.

Now, when alcohol is taken into the system, it at once begins to act upon the corpuscles and the fibrin. It has already been explained that wherever alcohol is present it extracts water from the organs and vessels into which it enters. The immediate effect, then, of alcohol upon the corpuscles is to cause them to shrink, from loss of their contained fluids. Hence they present a diminished surface to the life-giving oxygen. The blood then tends to become thin, and the corpuscles betray their sickliness by changing

from a healthy red to a yellowish colour—a sure token that they contain less oxygen than they ought to do. All these appearances have been produced by experimenting on freshly drawn blood. If a small quantity of this be treated with alcohol, it will be found to absorb less oxygen than the rest does; and the same thing of course occurs in the blood when circulating through the body. It is this deficiency of oxygen in the blood that gives the dull colour to the skin which is so noticeable a feature in the complexion of a systematic spirit-drinker.

The first result of a diminished supply of oxygen in the body is, of course, that combustion is lowered. This means that the waste matters of the bodily organs will not be completely oxidised or burnt, and therefore less carbonic acid gas is given off by the lungs. Poison which ought to be got rid of is retained in the body. The evil is magnified by the fact that the alcohol itself uses up some of the oxygen for its own oxidation, for no doubt some of the alcohol is oxidised, though, as we have seen, the greater portion of it is simply eliminated. That part of the alcohol which is oxidised gives out carbonic acid, which remains in the blood; for the blood has become too impoverished, and has lost too many of its corpuscles, for it to be able to convey the carbonic acid to the lungs, or to bring back sufficient oxygen for the purifying processes to be fully carried out. So strong is the influence of carbonic acid that a considerable loss of energy is quickly felt when there is an undue proportion of it in the blood.

Probably it is the accumulation of this gas in the brain, as the result of the day's activities, which brings on the sleepiness of the night, and it is the cessation of bodily wear and tear during sleep that restores the balance.

The taking in of oxygen, then, is to our physical life what the putting on of coals is to the fire. If there be a long-continued deficiency of oxygen, the vital flame will become dim, will flicker, will even expire. Some weaker organ will first suffer. Perhaps the skin will become diseased, since the minute capillaries which ought to keep it well supplied with blood are too delicate to endure for long the interference with their functions; and blotches, pimples, eruptions, will make their appearance. Or it may be that the lungs are weakened, and some exposure to cold will throw them into a state of inflammation. Or the kidneys, liver, or brain will suffer from an imperfect supply of oxygen, and become congested, whence diseases of various kinds eventually arise.

Not only does alcohol cause these blood-discs or corpuscles to dwindle in size, but it is now ascertained that it absolutely destroys them, by breaking them up. This is a very serious thing, for it is by their agency that oxygen is carried to all parts of the body and waste materials burnt up and removed in the form of carbonic acid. Consequently, if there be too small a proportion of corpuscles in the blood, a good deal of waste matter will lie at various points in the body, leading to the formation of fat, and interfering with

the circulation of the blood. Now notice how all this causes mischief to the heart. The fat grows about it and stops the free passage of the blood, which then begins to clot. The pressure of the heart will now and then overcome the obstacle, and the freed blood will rush wildly away, causing that sense of faintness and giddiness which drives the poor deluded sufferer to the brandy bottle. But the heart cannot endure this ill-treatment for ever. It will become more and more weighted with fat; its right chambers, being the weakest, will be overcharged with blood, its elasticity will be decreased, and some day there may come a sad and fatal termination to the strife. A well-known physician, writing in the *Lancet* some years ago, said, "In affections of the heart there is nothing that so much favours the development of local congestion as these stimulants."

Not only do the corpuscles of the blood suffer from contact with alcohol, but the fibrin also is seriously interfered with.

The fibrin is of great service in building up the body; but if the blood collects together in places where it is not wanted, the fibrin will clot and interfere with the proper circulation. When you cut your finger this fibrin will after a time coat the wound and stop the bleeding. Every surgeon will tell you how he dreads to perform an operation on an intemperate person, for the deficiency of fibrin in the blood makes the healing process much more slow and uncertain than is the case with healthy and perfect blood. When the blood

becomes impoverished by defect of corpuscles and fibrin, the temperature of the bodily organs is reduced and none of these organs are adequately nourished. The heart itself at length suffers; for though it is the last organ of the body that dies, and continues its action feebly even after respiration has ceased, yet it cannot wholly withstand the repeated attacks of alcoholic irritation, and will gradually lose force, till, perhaps in some evil hour of untimely excess, it will cease altogether to fulfil those offices which for so long it has performed imperfectly.

Now let us inquire how alcohol affects the blood on its return journey from the extremities of the body to the lungs and heart, in order to get rid of its impurities and become re-charged with fresh oxygen. The return of the blood to the heart and lungs takes place through the venous system.

The arteries and veins at their extremities are exceedingly small and thin, and present the appearance of a very delicate network, the meshes of which are all interlaced (fig. 28).

At the tip of the finger, for example, is a tangled mass of thread-like vessels. They are so fine in reality that they cannot be seen by the naked eye. It is there that the arteries and veins join, and the blood is thus enabled to keep up its endless round. These very fine tubes are called capillaries, a word which means "hair-like." Through the sides of these capillaries the nutriment of the blood oozes, and thus feeds the tissues of the body. The veins get thicker

and thicker, till at length they pass by rather large ones into the right side of the heart, to be pumped from there into the lungs, in order to be replenished with oxygen, as I have already described.

The small blood-vessels, or capillaries, are controlled by minute nerves (vaso-motor nerves), and it is by their agency that the blood-vessels are kept in working order. If these nerves are over-excited the

FIG. 28.—Capillaries.

capillaries will fail in their action. A sudden shock will cause pallor in the face, which means that the blood-vessels of the face have momentarily ceased to transmit blood. Cold and trembling will be the natural consequences. When the face burns, it implies that the nerves have become deadened, and the muscular fibres of the minute arteries, being no longer subjected to the nerve-stimulus, relax their pressure on the blood-vessels, which consequently expand under the force of the circulating blood, and become gorged.

This reddens the face, and gives rise to the sensation of warmth. The warmth, however, is deceptive. The skin is overcharged with blood, and the surface of the body is therefore made slightly warmer. But it is only for a time. The heat escapes through the pores of the skin, just as does the hot air of an overcrowded room through an open window, and the body, like the room, becomes colder.

The vaso-motor nerves quickly recover their tone, and can tolerate a great deal of abuse, but the ill-treatment may go too far. Should they be paralysed too often they will not fully recover their sensibility, and then the capillaries become permanently expanded, giving rise to that tell-tale blotchiness or streakiness which reveals the toper. The reason why the nose usually suffers most is because it presents a large area of surface to the external air, besides which the circulation in it is feeble. Its capillaries being permanently enlarged and limp, and alcohol favouring the deposition of fat, this prominent organ will tend to grow red and large, presenting that repulsive appearance with which Bacchus so often decorates his silly devotees.

The loss of animal warmth is the cause of what we commonly call "a cold." It is really a mild form of inflammation and congestion. As Professor Huxley says: "The impression made by the cold on the skin is conveyed to the nervous centres, and influences the vaso-motor nerves of the organ affected in such a way as to cause their partial paralysis and produce that

state of congestion which so commonly ends in inflammation." What we have described as occurring in the case of the skin takes place in all the organs of the body under the influence of alcohol; and hence there may arise from intemperate habits some of the worst forms of internal inflammation.

While these local affections are caused by the interference of alcohol with the circulation of the blood, there are also at work all those other evils which have been described—the deterioration of the blood itself, the destruction of its corpuscles, the diminution of its fibrin, and the deposition of an excess of fat in places where it may work most disastrous effects. Our muscular and nervous activities being all dependent on a healthy condition of the blood, its impoverishment lowers the value of our whole life.

We have traced the blood through its whole course, from its first formation to its final functions. We have seen how it originates from food, and how it supplies what is essential to the digestion and assimilation of other food. We have followed it as it flows through the body and visits every part of the human frame. We have watched its processes in building up the body and recuperating the wasting tissues and exhausted energies of every organ. We have inquired into the conditions of its own vitality and of its effective performance of the duties nature has imposed upon it. And the one conspicuous and undeniable result of our survey is that alcohol gives rise to evils great and small which affect the blood throughout

the whole of its intricate journey, and injures more or less every vessel and organ through which it flows. How absurd it is, then, for people to imagine that the heart's action is helped by strong drink, or that the blood is improved by its use. The truth is that the heart is weakened and clogged, and the blood is rendered impure. The purifying work of breathing is counteracted, the blood-vessels are enfeebled, the value of life is diminished, and death is hastened. They are the strongest, healthiest, wisest, who "touch not, taste not, handle not" this deadly stuff; and if you will determine to pursue this course as long as you live, you will, with God's blessing, reach a ripe and happy old age, and will then realise the truth of Shakespeare's words which he puts into the mouth of one of his characters:

> "I am strong and lusty,
> For in my youth I never did apply
> Hot and rebellious liquors in my blood;
> Therefore my age is as a lusty winter,
> Frosty but kindly."

CHAPTER XIV.

EFFECTS OF ALCOHOL ON THE BRAIN AND NERVES.

OUR nervous system is a most elaborate and sensitive piece of machinery. There is no part of the body in which its fibres and cells do not exist. Every sensation or feeling, every thought of the mind, every decision of the will, is essentially associated with it. By interfering with its proper action, pain ensues, and it is the vehicle of all physical enjoyment. Mental life, the glory and crown of human nature, is equally dependent upon the regular and healthy performance of its functions. What duty, then, ought to seem more sacred to a rational creature than to consider how he may make the most and the best of this marvellous machine that is so capable of destroying or intensifying the value of life?

The Brain.

The brain is a very large mass of nervous substance carefully wrapped up in tough membranes, and securely fortified by the bones of the skull within which it lies. It is marked off more or less distinctly by fissures and

partitions into lobes, as may be perceived from the accompanying diagram (fig. 29). These lobes and glands, called in some cases ganglia, may be the centres for different kinds of nervous action ; but of this science knows as yet but very little. Speaking generally, the brain consists of two large bodies, the cerebrum, seen at the top of the picture, and the cerebellum at the bottom, which is very much the smaller and less important of the two. The outer parts are of grey matter, and contain many nerve-cells or ganglionic corpuscles. The interior portions of the brain consist of white substance, and are quite destitute of cells, being made up entirely of nerve-fibres connected by a supporting framework of delicate tissue.

FIG. 29.—Human brain.

In addition to these two large bodies there is another, much smaller even than the cerebellum, which, though not really a part of the brain, is yet usually considered along with it on account of the importance of its functions. Through it pass all the nerves which are given off from the brain, except those of sight and

smell; but these, properly speaking, are processes of the brain itself. The end of this body may be seen protruding from between the hemispheres of the cerebellum at the bottom of the figure. It is connected with the spinal nerve-cord, and is for that reason called the *medulla oblongata*, signifying the lengthened marrow. The slightest injury to this organ causes the most serious consequences to health and life.

The spinal cord is a long column of nerve-matter running down the interior of the backbone. It gives off nerves to the muscles and the skin, and it is by these that the movements of the arms and legs are determined. The whole of this vast system—brain, medulla oblongata, and spinal cord—is built up of minute cells and fibres which require a full and regular supply of healthy blood, rich in oxygen, for the perfect performance of their functions. These functions are the highest of which our bodies are capable, for the brain is the organ of the mind; and as a microscopist cannot get an accurate idea of the object he is examining if his instrument is defective, so neither can the soul enjoy or manifest its best life while the brain is out of order.

In addition to these nerves which are associated with the spinal cord, there are twelve pairs—differently grouped, however, by some—which run directly into the brain from the various parts of the body. It is by the impressions conveyed along these nerves to the brain-centres that the mind gains knowledge of the external world, and it is by means of that force which

the mind or soul transmits back through the nerves that thought and action become possible. How the soul utilises these ingoing currents, and sets up the outflowing currents, it is not our present purpose to consider, and it is one of the most profound inquiries of philosophy. It is evident from this brief description of the nervous system that the vigorous exercise of the intellect depends largely on the sound and healthy condition of the brain and nerves. Emerson has said that the first requisite for being a gentleman is to be a good animal, and that certainly applies to the thinker. It is a question worth our while to ask, then, whether this intricate and subtle mechanism, by means of which our mental life is carried on, can be best worked by water-power, or whether it needs the application of alcoholic stimulants.

Influence of Alcohol on Nerve-Matter.

What are the effects which are produced on the nervous system by the use of alcoholic liquors?

Having already shown that the blood is impoverished and its functions interfered with by putting alcohol into it, we might at once conclude that a healthy condition of brain could not possibly be maintained by those who use strong drink. But let us look at the matter a little more closely, and we shall find that there are specific evils wrought in the nerve-matter of our bodies by the introduction of alcohol into it. This can be made evident by a simple experiment, which, however, I do not expect teetotalers to make, but

which perhaps they may remember having made at some former time. Put a teaspoonful of brandy in your mouth and hold it there for five minutes. You will feel a severe burning sensation, and will most likely want to eject it long before the time is up. On examining the mouth you will see that it is highly inflamed. If you kept renewing the liquor for ten minutes you would probably find blisters making their

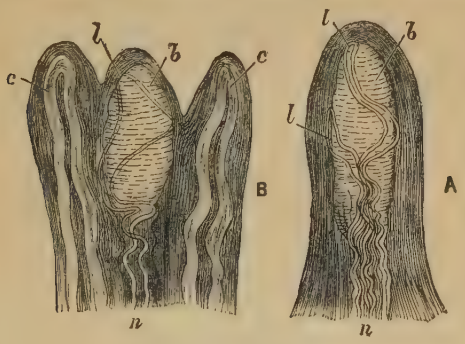

FIG. 30.—Papillæ of skin.

appearance. Now try to taste something else, vinegar or milk, say, and you will not be able to distinguish between them. The inflammation shows alcohol to be an irritant, while the loss of taste proves that it has narcotised your nerves into a state of temporary paralysis, thus acting as a neurotic poison.

In order to simplify the matter, and to give a concrete example of the evils inflicted on the nerves by the use of alcohol, we will consider the organs of touch. These are situated in many parts of the body,

but especially in the skin, and most conspicuously at the tips of the fingers. Here they consist of one or more nerve-fibres, with an outer covering and an internal core of soft matter. They are seen on the skin as papillæ. In fig. 30 A represents one of the simpler forms of these papillæ and B a compound form. The capillary blood-vessel is seen at *c*, the nerves of touch at *n*, and one of its loop forms at *l*. The internal core, *b*, is called the touch-body. The tiny nerves are the ultimate twigs of the vast and intricate tree which constitutes the entire nervous system of the body. The least impression made upon these nerves is flashed at once to the brain.

Among the marvels of modern science is the discovery of the speed with which these sensations are conducted, and it has been ascertained that a message which ordinarily occupies two-tenths of a second will, after two glasses of wine, require three-tenths of a second to traverse the same circuit. That is, there is a loss of one-third of the nervous activity, and the mental life is depreciated to that extent.

In the presence of facts like these, how can it be admitted that wine is a safe tonic for the thinker, the student, or the orator? Such may, by habit, become too dependent upon the artificial stimulus, and unable to do much without it; but who can tell to what greater height of excellence they might have attained, or how much longer they might have retained their skill, had they never become the slaves of a tyrannous and pernicious appetite?

The effects of alcohol on the nerves of touch are only an illustration of what must take place wherever the nerves are concerned. Their delicacy, accuracy, and quickness of action are interfered with, they become too scantily supplied with blood, and the muscular movements dependent upon them are disordered and deteriorated. The excessive use of intoxicating drinks leads to unnatural nervous excitement, loss of control over the muscles, glibness of speech without intelligence, and, in extreme cases, to helpless imbecility and babbling idiocy, all which are the symptoms and evidences of a disturbed and deranged nervous condition. Whatever, therefore, may seem to be the temporary advantage of unduly exciting the nerves with alcoholic liquors, it is purchased at too great a cost for any wise man to be willing to pay the price.

CHAPTER XV.

ALCOHOL AND INSANITY.

THE special evils inflicted on the brain by alcohol are thus summed up by Sir B. W. Richardson in his "Cantor Lectures":—

1. "A stage of vascular excitement and exhaustion"; that is, as I have previously described, the blood-vessels lose their elasticity and tone.

2. "A stage of excitement and exhaustion of the spinal cord." This induces paralysis of the lower limbs.

3. "A stage of unbalanced reasoning power, and of volition," which means incipient insanity.

4. "A stage of complete collapse of nervous function," which is equivalent to paralysis of those parts of the body governed by the affected nerve or lobe of the brain. The particular part of the brain which will suffer first or most severely will depend upon many considerations, such as heredity, previous habits, and other matters into the details of which I must not now enter. But of this we may be sure, on the testimony of the highest authorities, that the whole of our nervous functions, that is, our entire mental life, will be deteriorated.

The terrible consequences of lowering or perverting our brain functions are more or less fully known to every intelligent person. Such derangements as apoplexy, paralysis of legs, arms, and other parts of the body, softening of the brain, loss of speech, insanity, loss of will-power, are among the fearful afflictions which are brought upon men and women by prolonged intemperance.

The brain contains more blood than any other part of the body in proportion to size, and its tissues absorb greater quantities of water than do the muscular tissues. This fact, however, involves another. If brain tissue absorbs more water than do the other tissues, it will of course absorb more alcohol also. The changes consequent upon this lead to the giving out of increased nervous force. This is the explanation of that liveliness, jocularity, and general animation so often seen after a moderate quantity of wine has been drunk. But then, after the fire has ceased to blaze, dead cinders remain. The nerve-cells have been burnt up too rapidly, and the fire is choked with the ashes which could not be removed quickly enough. Owing to the presence of this effete matter, there is less activity, less interchange between the living cells, the vessels are not cleared, and soon ensues a period of heaviness and sleep. Such slumber is unrefreshing, and is, in reality, incipient apoplexy. The depression felt on waking, which is the usual and natural reaction from the state of animation caused by the wine, begets a craving for further stimulants and in increased

quantities, a craving that at length, by yielding to it, may be made irresistible. Mental and moral power is gone. Mind and will are dethroned, and lie helplessly subject to an unnatural appetite arising from organic nervous defect.

Dipsomania.

When this stage is reached, what can we call such a craving but disease? Dipsomania signifies an insatiable desire for intoxicating drinks, and is rightly regarded by medical men as a frightful mental malady. Have we not all met with its victims, men who perhaps at one time held a most honourable position in society, but who have gradually become the slaves of a raging, indomitable habit, and have at length grown utterly callous and careless to all the claims of family, business, and even religion? Moments of remorse may occasionally come, but probably the cup will be resorted to in order to drown memory and conscience. Other vices follow, every obstacle to the procuring of drink will be resisted, self-respect is utterly lost, disgrace, misery, beggary, rags, will all be embraced, and even theft practised in order to gratify the insane appetite for drink. All power of will is gone, no motive has a feather's weight against the one burning passion, and there is no hope of the life or salvation of such a man unless he be treated as one who is not responsible for his actions, and rigorously confined where there is no possibility of his obtaining the accursed poison that has made him a wreck.

Warning to Moderate Drinkers.

The mere risk of falling into so sad and horrible a condition ought to arrest and impress the most moderate drinker. Unfortunately there are many persons who are predisposed to this malady. Even if a man feels confident that he would never be likely to let habits of intemperance master him, yet the possibility of there being in him the baneful inheritance received from intemperate progenitors should make him pause in his indulgence of an appetite which, controllable as it now seems to be, may, if pampered, at length break out in paroxysms of thirst and craving. "The prudent man foreseeth the evil and hideth himself." To talk about moderation when such dire consequences are even remotely possible is the gravest folly. Will you deliberately breathe a moderate quantity of poisonous fumes or sewer-gas because you believe your body is strong enough to resist the evil?

That there is here no over-statement of the case could easily be demonstrated by hundreds of well-attested and startling illustrations from the reports of medical men, and officials of gaols, workhouses, and lunatic asylums.

During the Franco-German War, M. Lunier found that 55 per cent. of the cases of insanity which were in the Paris hospitals at one time were due to alcohol alone. Trouble and anxiety are frequently given as the ostensible cause of mental and nervous disease, but in many of these cases the abuse of

alcoholic liquors has led to the weakening of the brain, and so predisposing it to disease, whilst in the majority of instances the intemperance of some member of the family is the cause of the sorrow. From reports of hospitals and lunatic asylums at St. Petersburg, Dublin, Liverpool, Colney Hatch, and other places, it is shown that above half the patients admitted are the victims of intemperance, either their own or that of others, while for the whole of England and Scotland Dr. W. A. F. Browne has calculated that about one-fourth of the cases of insanity are directly attributable to the use of alcohol. Besides this, it is stated upon the highest authority that three-fourths of the idiots born are the offspring of intemperate parents. Mr. Darwin says: "When chronic diseases arise from the use of ardent spirits, they are liable to become hereditary, even to the third generation."

Seeing then that the use of alcoholic drink is beset with so many dangers, that it deranges the brain and dims the intellect, that at the best it is an unnecessary indulgence, and may become the cause of misery, crime, and madness, how sacred is the duty of the Social Reformer, the Philanthropist, the Christian, nay, of every rational person who desires to make the best of life, to abjure it, and to seek to banish it from the face of the earth.

CHAPTER XVI.

ACTION OF ALCOHOL ON THE MUSCLES.

THERE is a very close connection between the nerves and the muscles of the human body. The nervous current flows with extreme velocity from the brain to the muscles which are to carry out the orders received from the centre of sensation and thought.

In some way or other not perfectly understood the nervous impulse acts upon the muscles concerned, and they instantly move into the position required, in order to fulfil the behest of the will. This may be best illustrated by observing how we bend the arm at the elbow. In front of the upper arm there is a large muscle called the biceps. When the hand is raised up to the shoulder this muscle may be felt as a hard and swollen mass. The biceps muscle is attached to the shoulder by a very tough tendon. The other end of the muscle tapers off into a tendon which is connected with the bone called the radius, in the fore-arm, running from the elbow to the thumb. When we will to raise the arm by bending it upwards at the elbow, a nervous impulse travels from the brain-centre to the muscle, causing its fibres to contract and so shortening

the length of the biceps, which, of course, pulls the fore-arm upwards. At the back of the upper arm and attached to the bone called the humerus is another muscle called the triceps, which is joined to the elbow at the other end, and this reverses the action of the biceps when it is wished to drop or straighten the arm.

FIG. 31.—Muscles of leg.

As it is in the legs that an intoxicated man gives the most conspicuous evidences of his helplessness, we will explain how the muscles of the legs are worked and why they are affected in the ludicrous way which we have all witnessed. There are exactly the same number of bones in the leg that there are in the arm, and the muscles are attached to them in a corresponding way to what is the case with the arm-bones. The great muscles of the upper leg and of the calf are those which are chiefly concerned in walking, those of the calf, which reach from the shin-bone (tibia) to the heel, acting upon the foot as a lever. The femur of the thigh answers to the humerus of the arm, and the tibia and fibula of the lower leg corre-

spond to the radius and ulna of the fore-arm, the principal muscles being attached to these. The leg muscles are all controlled by nerves which are connected with the spinal cord, and it is well known that alcohol speedily affects this most important nerve-centre. Even before the brain suffers the spinal cord is profoundly disturbed in its functions. As Sir B. W. Richardson says, "There follows quickly upon this a deficient power of co-ordination of muscular movement"—that is, the rhythm and regularity of movement in walking are destroyed, and the toper reels and staggers. The muscles, which must be kept contracted when we stand still, are relaxed without the consent of the will when the spinal cord is excited by alcohol, and the body falls forward. By continued excess the structure of the muscles will be injured, they will permanently refuse to answer to the nervous stimulus, and paralysis will ensue.

All muscular work is dependent on nervous force. It is evident, then, that nervous action ought to be jealously guarded against injury in order that the many delicate muscular movements of ordinary life may be carried on with precision and comfort. Suppose you are watching a moth which you want to catch. Every movement of your eyes as they follow the flying insect is determined by the action of a rather intricate set of muscles connected with the eye-balls. The legs and arms are similarly brought into action, and their many movements all involve muscular activity as you step here and there and

throw out your arms in the pursuit. Even the delicate movements of the larynx in talking and singing are carried on by means of muscles stimulated by nerves, and with such nicety is this accomplished that a singer can adjust his vocal chords to the thousandth of an inch when altering the pitch of a note. But this could not be done by any one in a state of intoxication. Every one has observed how unnatural and uncertain is the voice of a person who has too freely indulged in the hilarious cup. We can now understand how it is that the best athletes, the most enduring toilers and travellers, the finest marksmen, cricketers, and oarsmen, are those who abstain from intoxicating beverages.

Sir B. W. Richardson has described an experiment on a frog which admirably illustrates the effect o alcohol on the muscles. He attached a weight to the hind leg of the animal and stimulated it to movement by means of electricity. After administering several doses of alcohol he observed that the muscle became more and more feeble and uncertain in its action, until at length its power was reduced by one-half. Evidently, therefore, the idea that alcoholic beverages impart vigour to our muscles, like many other notions concerning this much-belauded deceiver of mankind, is a complete delusion.

We have referred only to those kinds of muscular activity that are voluntary—that is, such as are controlled by the will. But there are many muscular movements which are not subject to the will, among

which may be mentioned the beating of the heart. If the contraction and dilatation of the heart were determined by the will it would be impossible to attend to anything else, for a moment's forgetfulness would cause it to cease to beat, and we should faint or die. Curious to say, all voluntary muscles are marked with transverse lines, or striations, as they are called,

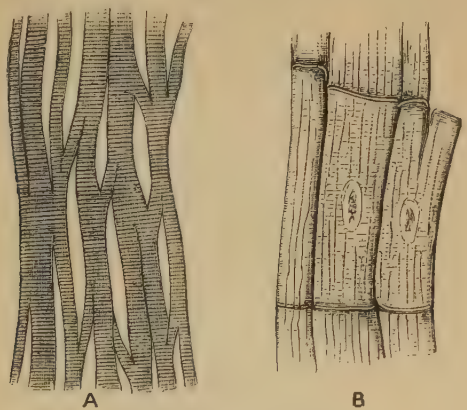

FIG. 32.—Muscular fibres.

while those muscles which are independent of the will are destitute of these striations. Illustrations of these two sorts of muscles are shown at fig. 32. The muscles of the heart, however, are an exception to the rule, for they are striated which has led to the supposition that this important function is related in some special way to the higher centres of the brain.

All muscular exercise is attended with wear and

tear of these muscular fibres. They are burnt up or oxidised, and the effete matter is removed by the blood. This, of course, is the case also with all other kinds of animal energy. Every organ wears with using. Brain-cells and fibres are consumed by thought. Every time we move a muscle more or less of its tissue is destroyed. The growth of new muscular fibres in a healthy body goes on simultaneously with their decomposition. The first stage in muscular growth is the deposition of fatty materials from the blood, and this fat is soon oxidised, the resultant carbonic acid being carried off and nitrogenous material added, which eventually forms the new muscular fibre. But the presence of alcohol in the blood, as we have seen, causes it to bring too little oxygen; hence the fat is not wholly oxidised. Fat is good in its proper place, but it is unfortunate when it takes the place of muscle. This fatty degeneration, as it is called, is a constant accompaniment of the presence of alcohol, and many grave bodily disorders may, no doubt, be traced to this cause. Although fatty degeneration may occur locally in the case of lean persons, yet ordinarily it affects every part of the body when it results from the constant use of alcoholic drinks. Fat accumulates in such cases to a disproportionate degree, and a ponderous body is often developed. Instead of a firm strong muscle, there is a soft flabby bulkiness—an increased burden to carry about with weak and defective muscles to do it with. The fat more easily oxidises than muscular tissue,

and hence uncomfortable heat is generated. Another product of the oxidation, water, is formed in excess. The blood, endeavouring to remove this water and other waste materials, is reduced in consistency, while the superfluous substances lodge wherever they can, and not infrequently lay the foundation of dropsy and other fatal diseases. We can now understand why beer-drinkers often look robust and stout, whereas, in truth, they are only fat, finding every effort irksome, wearied with every task, and drooping prematurely into the impotency of old age.

There is another evil resulting from the interference of alcohol with muscular action on which a word or two ought to be said. If the section of the skin be examined (fig. 15) it will be found to contain tiny glands, called the sebaceous glands, and small muscles fixed near the root or bulb of each hair. These sebaceous glands are like minute bunches of grapes, and their office is to supply the hairs with oil. The muscles act in erecting the hairs. Every one knows what is meant by the term "goose-skin." It arises from cold, which causes the muscles of the skin to contract, thus raising the hair-bulb and making the hairs stand almost erect. This is a provision of nature to prevent too great a flow of blood to the skin, which would easily lose its heat there by contact with the cold air outside the body. In a similar way birds are protected from cold by the erection of their feathers. Now if the nerves causing the contraction of the hair-muscles are weakened by

alcohol, the muscles themselves expand, more blood rushes into them, and gives off its heat ; hence inflammation, more or less severe, is likely to be set up. The same process may be induced in the case of the internal organs, and thus inflammation of the lungs, liver, and kidneys may be caused.

CHAPTER XVII.

IS ALCOHOL A MEDICINE?

AMONG medical practitioners it is an open question as to whether alcohol is a medicine or not. Opinions, even among experts, are divided, some thinking it an indispensable agent in special cases, while others reject it altogether from their prescriptions. There can be no doubt, however, that the medical faculty is growing increasingly distrustful of it. We rarely hear of its being recommended by medical men. The wholesale and indiscriminate use of it in medical treatment which prevailed a quarter of a century ago has given place to a cautious and limited adoption of it, and only then in special cases and for temporary purposes. It may be doubted whether any medical man of experience now believes in it as a remedy or as possessing curative properties, and a very small proportion of our doctors regard it even as a tonic. That it will either cure or prevent disease no one who is in possession of the full evidence of the case believes ; that it may in some instances act as a palliative of suffering need not, perhaps, be denied. But no honest practitioner will administer a

palliative if he fears that it will lead to disastrous consequences, and the fact that alcohol does this is being more and more widely accepted as its real action on the human body is becoming better understood.

In dealing with disease, the main thing is to find the cause and to counteract it, and next, to invigorate the vital organs of the body. Does alcohol render any service in either of these objects? Does it feed or strengthen the body? does it help in the assimilation of food? Does it check unhealthy processes in the system, or promote and benefit those which conduce to sound and vigorous life?

So far as the feeding or strengthening qualities of alcohol are concerned, we think it has been fully demonstrated that it is not only destitute of these, but that it actually destroys food and prevents its assimilation. It renders food less solvent, it impairs the gastric juice, it injures the digestive organs, and it dulls the vitality of the villi through which nutritive material passes into the structures of the body. It excites for a time, but afterwards it stupefies. It flies to the brain and spinal cord and liver, and thus disturbs nervous and muscular activities. It clogs the lungs, kidneys, and skin, and prevents them from throwing off the waste products of the vital energies. It favours the clotting of blood and the accumulation of fat, both of which render us liable to grave perils. From all of which it follows that even if there are occasions when its temporary use may be beneficial, it should be administered with great caution and only

in extreme and exceptional circumstances. These are not the opinions merely of "fanatical teetotalers," but they are the matured conclusions of scientific men who have profoundly studied the effects of alcohol on the body.

It is well known that alcohol tends to run through the system very rapidly. Now what can be the use of taking as a medicine that which does not remain in the body long enough to effect any real benefit? But being a powerful irritant it inflames the organs through which it passes, and inflicts upon them all more or less of injury. If it should be said that it is in this very rapidity of its action that its virtue lies, then we may ask, Why should the patient continue to have recourse to its supposed advantages? If a medicine has to be kept up for years, surely it cannot be of great service! I have heard of an old pensioner who decided to abstain so long as he kept well, and he was "poorly" ever afterwards. Probably most of the complaints for which alcoholic beverages are taken are as unreal and imaginary as that of the pensioner.

I have no wish to affirm that alcohol is entirely destitute of all value in medicine, but only that it is such a dangerous remedy that it should never be resorted to without skilled advice and careful control. For external application it is useful in allaying the inflammation caused by scalds. But even this proves it to be inflammatory in its action, and therefore fraught with perils if taken internally. It outburns the scald and dulls the nerves of the inflamed part.

In extreme nervous depression it may be used as a temporary shock; but to shock the healthy nervous system is perilous. And if the impulse be too great, death by poisoning may be the result. A rabbit has been thus "shocked" to death by two or three ounces of alcohol. Again, the heart or kidneys may, under some circumstances, be helped in their functions by methodical alcoholic treatment; but if it proceeds beyond the sedative stage the result may be fatal. These admissions may safely be made in the present state of medical science, though it must be pointed out that medical opinion, on the whole, is disinclined to make them. But let it be granted that there are cases where the skilled use of alcohol is an advantage, what can be inferred from this but that alcohol should be confined to the surgery and dispensary, and that we should no more administer it to ourselves freely and on all occasions, than we should swallow unlimited quantities of other drugs and poisons which we take for temporary purposes and only by the advice of those who understand their antidotes and their effects on the human body?

Medical opinion has in the past been a stumbling-block in the way of Temperance reform, but the world is becoming more enlightened. Here and there the desire to gratify a patient may lead a doctor to prescribe wine; but the custom is dying, though it may be dying hard. It is only very recently that medical men have understood what food really is, and now they are learning that alcohol is not food and that

nothing but food can impart strength. The errors that dominated the old generation of medical men have been thus vigorously and aptly described by Dr. Trall: "They have mistaken vital resistance for a physiological process; they have mistaken morbid action for normal function; they have mistaken inflammation for nutrition; they have mistaken fever for food; they have mistaken waste and expenditure for accumulation and supply; in short, they have mistaken disease for health."

When it is borne in mind how strong are the popular prejudices in favour of alcoholic drinks, how deeply rooted are the customs of society, how dense is the ignorance of even fairly well educated people in regard to chemical and physiological laws, it is a matter for thankfulness that the medical faculty seems to be rapidly advancing towards the much-desired goal when alcohol will be prescribed with as much sense of responsibility and with as scrupulous care as is the case with all other poisonous substances.

The most curious feature about the belief in the remedial properties of alcohol is that it is supposed to cure everything. Whatever may be the nature or the cause of the illness, the devotees of alcohol fly at once to their favourite remedy. It is the one universal medicine for all diseases. It is the panacea for every ill that flesh is heir to. Now every one who has the least glimmering of an idea as to the nature of disease and the methods of cure knows perfectly well that there is no one single drug in all the world which

can accomplish what many imagine alcohol can effect. Drugs have their affinities with certain organs of the body, they act in well-defined channels, and are prescribed for well-understood reasons. Drugs which do not answer to these conditions are looked upon with disfavour and suspicion by medical men. But, o course, it is only the inexperienced who ascribe to alcohol all these virtues and wonderful powers. Those whose judgment is worthy of confidence understand well enough how alcohol acts, what organs of the body it has most affinities with, and what results it will produce. And these agree that the constant use of alcoholic beverages is perilous, that they are injurious to life and health, and that to produce such results as are desired the dose must be increased until the quantity is out of all proportion to the effects, being so excessive at last as to cast both body and mind into a state of debility and disorder from which it is well-nigh impossible to rescue them. What a strange infatuation it is that leads so many to adopt this dangerous mode of dealing with their bodily ailments, and how much greater still the folly of those who, having no ailments to cure, yet deliberately and needlessly pour into their system a poisonous fluid which, whatever may be thought about its influence on disease, can produce no effect but a prejudicial one upon health.

We conclude this chapter with a few expressions of opinion on the subject from several able and well-known medical experts. Dr. Higginbotham declares

that alcohol, so far from curing disease, is "the most fertile producer of diseases, and may be considered the bane of medicine and the seed of disease." Again, he says: "For about thirty years I have not prescribed alcohol as a medicine, so that I have fully tried both ways, with and without alcohol; and I perfectly agree with the Scotchman who said honesty was the best policy, for he had tried both ways, and he had really found out that honesty was the best policy. I am now fully of opinion that a more dishonest or cruel act cannot be inflicted on a patient than to prescribe or order alcohol as a medicine."

At a Conference of medical men held in London in 1869, the most emphatic denunciations of alcohol were uttered by many of the ablest physicians who spoke, and there was an almost undivided opinion that alcohol ought not to be administered as a medicine. Dr. Monroe, of Hull, said: "It is now seven years since I have ordered any alcoholic drink, either as a medicine or diet; and the success attendant upon its disuse in cases where in former years I should have ordered it largely, and condemned myself if I had not done so, is so gratifying as to lead me to its entire abandonment in the treatment of disease. In typhoid fever, as well as in other cases of fever of the worst character; in cholera, and in sudden and violent hemorrhages; in delirium, in rheumatism, in gout, and in many other diseases, the success of this treatment, without the use of alcohol, has been most marked and satisfactory."

In a Report of the London Temperance Hospital, the death rate among the patients is said to have been only 6 per cent., which is very much below the average in hospitals. Dr. Edmunds, who treated 683 cases, writes : "I have not, in any case, thought it necessary to prescribe the use of alcoholic beverages as medicine. The results of the non-alcoholic treatment have been, in my judgment, entirely satisfactory, and the treatment has, moreover, done much good in directing attention to the errors in diet, work, etc., which were the real cause of the disease, and by dispelling mischievous illusions as to the supposed advantages of resorting to alcoholic beverages." Dr. S. W. Moore likewise, in his part of the Report, gives similar testimony in regard to surgical cases. He says : "Among the 306 patients who have been under surgical treatment it has not been deemed necessary, in one instance, to administer alcohol in any shape or form." The successive Reports of this valuable Institution all furnish undeniable proofs that in no case either of sickness or surgery is it of any advantage o give the patient an alcoholic drink.

CHAPTER XVIII.

IS ALCOHOL A TRUE STIMULANT?

IT has become so common to speak of alcoholic liquors as stimulants that most people now take it for granted, without hesitation and without inquiry, that they really are so, and that it is only the excessive use of them that constitutes an evil. Whenever any one is suffering from overwork or from debility of any kind he is often persuaded to fly to wine or beer as a tonic or stimulant, which, it is supposed, will restore the impaired vigour, improve the appetite, and bring back nervous and muscular energy.

What is a Stimulant?

Usually a stimulant is thought to be that which spurs us on to greater effort than we could make without it. But may not this be a doubtful benefit? If a horse is jaded, whipping may stir its flagging energies for a moment, but the efforts it puts forth only rob it in reality of what little failing strength is left. By such treatment the animal is worn out and may die. It is rest and food that it needs. We were

never intended to live on stimulants. Though they may be essential at times, they should be reserved for such times. If they be not, then we shall suffer as the overworked and overwhipped horse suffers. The constant use of stimulants will reduce sensibility and cause ultimate loss of power. Sir Benjamin Brodie says: "Stimulants do not create nervous power; they merely enable you, as it were, to use up that which is left, and then they leave you more in need of rest than before."

A true stimulant is that which gives strength, not that which merely prompts the use of it. Hence good nutritious food is the best stimulant, and where the conditions of health have been violated, we must have recourse to those tonics which nature provides and which work in harmony with nature's laws.

We have no evidence, however, that alcohol is, in any true sense, a stimulant. It narcotises, it paralyses, but it does not really stimulate. It deadens sensibility to pain and fatigue, and the will acts unintelligently in putting forth unwise and destructive efforts, but it does not feed, it does not add to organic force; hence it cannot be properly regarded as a stimulant. It quickens the pulsations of the heart, and drives more blood to the surface of the body, thus giving rise to a feeling of strength, but the effect is only temporary. The goad prompts to exertions which are beyond the powers of the overwrought body. Animal heat is lost. Digestive and nervous functions are depressed. A reaction comes on, and the lassitude and weakness

are greater than ever. It was strength that was needed, not a goad, food, not a stimulant; but these alcohol cannot supply, for it possesses no nutritive property. They therefore who prescribe it for exhaustion or debility do but pander to popular taste and trade upon popular ignorance, while at the same time they increase the danger to which their patients are exposed. Fresh air, good food, muscular exercise, by which the body throws off effete matter and the appetite is sharpened, these are the natural methods of increasing and retaining strength; but, to quote Richardson, "Alcohol excites to waste, loads the body with its bad self, checks the proper excretion waste products, reduces the appetite, and impairs of digestion."

The cause of debility or weakness, when the craving for stimulants is most usually felt, is generally some unhealthy condition of one or other of the vital organs. Most frequently it arises from bad digestion. Where it proceeds from organic disease, as in consumption, the case is more serious, and is certainly aggravated by the use of alcoholic drinks. Many of those who have recourse to these beverages do so not on account of actual disease, but because they feel worn or fatigued. When such feelings are constant they may indicate overwork or morbid anxiety. There is no cure for these ills save rest and change. Alcohol can never do more than render us liable to severer attacks, by depressing our vital energies and making it more difficult for us to withstand the cause of the

ailment. But apart from these exceptional causes of debility, most of us during adult life occasionally experience a sense of weakness which springs from disordered digestion. The salivary secretion or the bile may be defective in some particular, or there may be some article of our diet which does not agree with us. It is safe to say that nine-tenths of the cases of lassitude which prompt us to seek a stimulant are of this nature. But there are stimulants which every medical man can prescribe for such ailments, stimulants which are effective in their action and are free from all the disadvantages and risks which attend the use of alcoholic beverages. Alcohol in any form hinders digestion, and no course can be more foolish or dangerous than to have recourse to it when suffering from digestive derangement. It is true there is a sort of feeling of comfort and support which follows upon the taking of a glass of wine or beer, but this merely means that sensation is dulled or that the heart's action has been accelerated for a time. The cause of the suffering is not touched, even the symptoms are only allayed for a brief period. There is no support, no strength, imparted by the alcohol. The reaction will come, the sense of depression will intensify, and enlarged doses to meet the demand will only aggravate the evil. Alcohol can in no way be regarded as nutrition or as doing anything but hindering the assimilation of food. No better advice can be given to persons suffering from languor or debility, from whatever cause originating, than that which Dr.

Samuel Wilks gave to the students of Guy's Hospital: "Endeavour, if you can, to erase from your minds that it is a proven fact that alcohol is a tonic or a necessary part of every one's beverage." Those who will clear their mind of this idol and attend to their food and their general habits need rarely be troubled seriously with indigestion. Fresh air, sufficient exercise, milk and farinaceous foods in moderate quantities, and sedatives which will allay irritation of the stomach, will work wonders even in serious cases, whereas alcohol always intensifies the evil and adds many others to it.

It is by those who have to endure great mental strain that the craving for alcoholic stimulants is generally felt most intensely. Amid the exciting conditions of modern life there is a strong temptation to fly to this delusive remedy. The man of business, jaded and worn, finds in it something that seems to restore his exhausted vitalities. The scholar and thinker believe it has the power to excite the activities of the mind. It is curious that these supposed effects are exactly contrary to one another. Can the same thing be a sedative and likewise a stimulant? It is a most wonderful thing, this alcohol. It is good for keeping out the cold, and it equally protects against the heat. It cures sorrow and it increases joy. It soothes the excited nervous system and it stimulates the brain.

There is but one efficacious remedy for overstrain of any kind, and that is rest. A Burns or a Sheridan may, by injudicious indulgence in the cup, stir into

fitful paroxysms their torpid genius, but it is at the expense of brain substance. A flame so unnaturally supported will burn out life too soon.

A very useful and instructive book, entitled "Stimulants and Study," was prepared a few years ago by Mr. A. A. Reade, in which are given the opinions and practice of a hundred and twenty-four of the most prominent scholars and workers of the time in reference to the effects of alcohol on brain work. Of these thirty are total abstainers, about as many more are nearly so, and almost all confess that their work is done best without wine. Dr. Carpenter says: "I have never felt the need of alcoholic stimulants as a help in intellectual efforts." And this was at a time when he was absorbed in most profound microscopical investigations. Dr. Dallinger, though not a pledged abstainer, says: "Alcohol is not at all necessary to my vigour of either body or mind." Darwin writes: "I drink a glass of wine daily, and believe I should be better without any." Dr. Fairbairn has never taken alcoholic liquors. Haeckel, the celebrated scientist, is almost an abstainer. Oliver Wendell Holmes drank very little, and approached nearer to abstinence as he grew older. Isaac Pitman is almost a life abstainer. Mark Twain thinks alcohol is a stimulant to the tongue, but a clog on the pen. Bishop Temple found he suffered much less from weariness after he became an abstainer. Dr. F. R. Lees and Sir B. W. Richardson are well-known hard-workers, and are abstainers.

Facts like these put it beyond question that the brain does its best work when unclouded by the fumes of alcohol, and that the intellect is quite capable of performing all that is possible to it without the artificial and perilous aid of intoxicating liquors.

Tea, coffee, and in some cases cocoa, are good and helpful stimulants for brain-workers, where any such substitutes for water are desired. But these drinks are foods as well as medicines. They restrain the waste of tissue and act as a tonic (neither sedative nor truly stimulative), and hence they tranquillise the nerves and diminish the tendency to congestion. So long as they are taken weak and in moderate quantities, they are perhaps the safest and most pleasant drinks that can be enjoyed by those whose habits of life and profession make large demands upon their nerves and brain.

CHAPTER XIX.

IS ALCOHOL A POISON?

THE poisonous effects of alcohol on the human body have been thoroughly studied by scientific experts. The commonest of these effects, and usually the first to be observed, is that which is described by the word "intoxication," the very meaning of which implies that alcohol is a poison. The dictionary informs us that the word is derived from the Greek for "arrow-poison." It used to be the custom, and still is among savages, to rub the tips of arrows with poison, so as to ensure the death of any one who might be wounded by them. You see, then, that intoxication by its very name is declared to be a sort of poisoning.

It is most diverting to notice what flattering things are said about alcohol, and what nice names are given to it. But you know how easy it is to be deceived, and what strange beliefs grow out of ignorance. I want you to understand the truth about alcohol, so that you may not be led astray by what those who like it may say about it; and I shall try to give you good reasons why you should not believe all the

pleasant delusions which many labour under who are given to the use of intoxicants. Let me first of all, then, make it clear what a poison is. One of the leading medical writers says that a poison is "any substance which, absorbed into the blood, is capable of seriously affecting health or destroying life" (Dr. Taylor's "Medical Jurisprudence," vol. i., p. 175).

It must be remembered that poisons act in many different ways. Some, like caustics, destroy animal structures; others, like ammonia, irritate or inflame; others, like prussic acid, affect the nerves. Some poisons are taken up at once by the blood and are carried through the whole system, but many are specially attracted by one particular part of the body, as for example strychnia, which chiefly impresses the spinal cord, and opium, which affects the brain. Then again, some poisons kill at once, others only after setting up certain diseases, or by repetition of the doses. Alcohol seems to possess the properties of various poisons. It inflames, it enters into the blood, it quickly finds its way to the brain, it sets up diseases, and eventually, if persisted in, it affects every organ of the human body.

As to the immediate and serious consequences which arise from taking a large dose of alcohol there cannot be the slightest doubt. About fifty years ago some experiments were conducted by Dr. Percy on dogs, in order to ascertain what was the truth upon this subject. In one case he forced into the stomach of a full-grown dog about as much alcohol as is contained

in a pint of ale—that is, two-and-a-half ounces—and the animal, with a howl, immediately fell dead. Dr. Taylor, whose definition of poison I have just given you, relates that a boy seven years of age was killed by drinking two wineglassfuls of brandy. It is quite certain, then, that a not very large dose of alcohol is sufficient to destroy life. Says Sir Andrew Clark, "Alcohol is a poison; so is arsenic."

It may be wondered that so few people, compared with the multitudes who use intoxicating liquors, are poisoned. No doubt there are numerous deaths that would be attributed to alcoholic poisoning if we knew all the facts of the case; but the number of those concerning which the evidence is clear is sufficiently large to be startling. Then it should be borne in mind that the body can be educated to absorb and tolerate poisons. There are persons who could swallow, without any apparent injury, six times as much laudanum as would kill any one who had not contracted the habit by degrees. But it must not be thought, because poison may be taken in this way, that therefore no mischief is wrought. Some delicate structure has been injured, some sensitive organ has been damaged, some condition of health has been interfered with, the seeds of disease and death have been sown.

If you drop a grain of sand into the works of a watch every morning, it will be some time before you will see any serious mischief; but at length the watch will begin to lose time, it will occasionally stop, and

at last some delicate adjustment will be thrown out of balance or some fragile wheel will break, and the whole mechanism will fail. So, by the continuous use of small quantities of alcohol, the blood will gradually become impure, the brain will lose a part of its sensibility, the liver will grow hard, the heart's action will get weaker, and some day the boundary-line between health and disease will be crossed, the defective organ will break down, and the entire machinery of life will collapse. The agent which can produce these dire consequences is rightly called a poison. Hence you will find that those men of science who have most carefully studied the effects of alcohol on the human body all agree in regarding it as a *poison.* Dr. Christison, one of the highest authorities in such matters, says: "The sedative action of alcohol on the brain constitutes it a powerful narcotic poison. For its effects as such, if rapidly brought on by a large dose, there is no antidote known."

In regard to the effects produced by constantly taking smaller quantities of alcohol in beverages, we have the united verdict of many medical and chemical experts. Richardson thus sums up his examination of these effects: "It deranges the constitution of the blood; unduly excites the heart and respiration; paralyses the minute blood-vessels; increases and decreases, according to the degree of its application, the functions of the digestive organs, of the liver, and of the kidneys; disturbs the regularity of nervous action; lowers the animal temperature; and lessens the

muscular power." Dr. Parkes gave similar testimony before the Royal Society in 1872. Sir Henry Thompson and many others in different parts of the world have adopted the same conclusions. On evidence of this kind, then, given by such men, we are warranted in labelling alcohol as a POISON, for it has been put upon its trial before experienced and unprejudiced judges and witnesses, and found guilty of causing injury to body and mind, and even of destroying life.

CHAPTER XX.

POISONOUS ADULTERATIONS OF ALCOHOLIC LIQUORS.

THE dangers which attend even the moderate use of intoxicating drinks are unfortunately aggravated by the many adulterations which are practised in the manufacture of the various alcoholic beverages which are commonly sold and drunk. The case is bad enough, even if we were sure of always getting the best and purest alcohol ; but how much worse it becomes when bad spirits are used and all sorts of poisonous concoctions are regularly drunk ! It is useless for moderate drinkers to say they have confidence in the quality of their liquors, for it is well known that very little of the vast quantity of wine, ale, and spirits sold in this country is absolutely free from adulteration of one kind or another.

Brief reference has already been made to one or two forms of adulteration ; but there is a great deal more that ought to be said on this point, especially in reference to poisonous adulterations.

The first kind of adulteration to which I will refer is the use of the inferior and cheaper types of alcohol

described in the first chapter. I have already stated that alcohol is got from many vegetable substances besides the grape and the sugar-cane. Now, many of these vegetable materials contain principles or elements which pass over into the spirit; and some of them are highly injurious to the body. There is methylated spirit, which is so largely used in the arts and for burning in lamps. It is obtained by distillation from wood, and is lighter than the common or ethylic alcohol. This would not cause more serious mischief perhaps than the ordinary alcohol of sugar if it could be got pure; but it is rarely found in an absolutely pure state.

Then there are the heavier alcohols which are left behind after the lighter spirit has been obtained by distillation. One of these is called propylic alcohol. It is cheaper than the lighter form, and therefore offers inducements to adulteration. Its effects are much worse and more prolonged than those which follow the use of ordinary spirit. There is also the heavy alcohol called butylic alcohol, which is left behind after distillation from beetroot treacle. Richardson ascertained that the tremors of *delirium tremens* may soon be induced by the use of this spirit, and that the organs of the body are thrown into an unnatural and diseased condition. Fusel oil, or potato spirit, the amylic form of alcohol, is frequently used for adulterating liquors. Dr. Hargreaves, in referring to this deadly spirit, says: "A man, whose business, he informed me, was to mix liquors for the retail

dealers, called upon me for one dram of burnt sugar, one dram of tincture of capsicum, and one dram of fusel oil. He said by adding the above to five gallons of common whiskey it could be diluted with five gallons of water, and thus make ten gallons of whiskey as good as is generally sold in the retail drink-shops."*

I must here explain that in speaking of pure spirit I do not mean that there is nothing but pure alcohol in the liquid referred to. Such a liquid would be denominated absolute alcohol. But it would be quite impossible for any one to drink that in any considerable quantity, and live. If a very small dose of absolute alcohol were put into the stomach, it would at once cause such intense inflammation that death would speedily take place. Alcohol must be mixed with some other kind of liquid in order to keep it in quantities or make it drinkable. What is called proof spirit is very nearly one-half water. But whatever be the quantity of spirit in alcoholic drinks, the quality of it may be pure or impure, and it is the impurities that do so much to produce the worst evils of spirit-drinking in this and other countries, especially amongst the poor.

All wines that contain above 17 per cent. of alcohol must have been adulterated, for that is the limit that can be obtained by fermentation of grape-juice. Most

* "Alcohol and Science," p. 40.

wines are brought up to 20 or 25 per cent. of alcohol, usually by adding amylic alcohol.

Besides those adulterations which consist in the mixing of bad spirit with the beverage, there are many others well known to the trade, and some of which are most injurious to the health. Finings for wine, the purpose of which is to give wine greater clearness and to correct acidity, are sometimes made with a mixture containing sugar of lead and gypsum. It is true the sugar of lead is broken up by chemical action, and the sulphur of the gypsum mixes with it to produce sulphate of lead, which falls to the bottom ; but who can say that the whole of this deadly substance is removed from the wine ? Gypsum is specially favourable to *calculus*, a most painful and fatal malady, which arises from an excess of limy deposit in the body. In a book in my possession, entitled " The Wine and Spirit Merchants' Companion, or Complete Instructor to the Trade," there are some hundreds of recipes for the benefit of John Barleycorn. Some of them, it is admitted, are harmless enough, but many of them are of such a nature as should make any sensible person shrink from the risks of using strong drink.

One of these mixtures enables a publican to add twenty gallons of water to a hundred gallons of gin. The twenty gallons of water need not be objected to—it is probably the only good part of the precious concoction ; but it is rather startling to find an ounce of oil of vitrio recommended, one drop of which will

fetch up a blister on the finger. The author very kindly says that vitriol, if properly mixed, need not be feared; but opinions may differ on that point—and what if the mixture be not properly made? There are also recipes for making English brandy look like French, for imitation claret and champagne, and other cheap wines, the ingredients of which are not specially objectionable perhaps, but all such methods show how the wine-drinker is gulled, and how very unlikely it is that the "nutritious juice of the grape," upon whose virtues he bestows his warm and eloquent praises, has had anything to do with the curious mixtures he is content to put into his stomach. Port wine, I find, can be made with cider mixed with a little brandy and port, and coloured with cochineal. We may be willing to have our clothes dyed with cochineal, but who would care to have his stomach and the whole interior of his body painted and injured with this noxious substance? Beer, it seems, can be helped by putting a little soap and American potash into the still. I am rather relieved to find towards the end of this little volume the following hint: "Some articles introduced in brewing and in the management of beer, being contrary to the excise laws, the brewer must use his own judgment if he brews for sale; private individuals can use what they please." Some probably have not much confidence in the brewer's judgment; and after looking through my little book and observing the kind of things that are advertised week after week in the publications that circulate among licensed

victuallers, I cease to wonder that so many of them are able to retire into a life of ease and style after a comparatively short business career.

Gin is a spirituous liquor which offers special inducements to the adulterator, for it is largely consumed by the poor, who, unfortunately, exhibit a strong preference for that biting and creamy property which can be most easily secured by the admixture of foreign ingredients. It is almost always charged with oil of juniper, the essence of angelica, and various vegetable oils. It is sweetened with oil of almonds and vitriol, which have to be treated with alum and carbonate of potash. Its creaminess is obtained by means of sugar, garlic, Canada balsam, or turpentine.

In the "Cantor Lectures" we have the following quotation from a book which is in the hands of most retailers: "As a tolerably safe general rule there will be no occasion to fear dissatisfaction when sweetened gin is not brought below 35 or even 40 per cent. under proof. It is then really five times as strong as old ale. Much more is thought of a pleasant, warming, aromatic taste, or smack, than of simple alcoholic strength. But, as the most careful man may sometimes overshoot the mark in reducing, it is advisable to know how to restore the requisite degree of pungency and sharpness without having recourse to the use of so expensive an agent as spirit of wine. Supposing, then, that by accident the strength of a parcel of gin has been lowered rather too far, a good and cheap remedy is the following:—For 100 gallons, 1 oz. of

cassia, and ½ oz. of chillies. Steep for a week in a pint of spirit of wine ; then mix well with the gin." And this is after all the other noxious substances have been put into it, to secure that it shall be "biting and creamy"! Oil of juniper has a most injurious effect on the kidneys ; oil of bitter almonds usually has in it more or less of prussic acid, which acts powerfully on the nerves ; and potassa exercises a very baneful influence on the mucous membrane.

Absinthe is largely used for adulterating purposes. This is obtained from wormwood, and acts with virulence on the nervous system. When administered to animals it produces epileptic convulsions, with signs of extreme terror. This deadly poison is now commonly made use of with grave peril to the well-being of the community.

Alcohol itself is poisonous enough, without taking into account the thousand and one hurtful things whose acquaintance is made by the brewer and the publican. But the examples of adulteration to which attention has been drawn will show how impossible it is for the habitual drinker of alcoholic liquors to escape slow poisoning.

He may laugh at your warnings, and pooh-pooh what he calls your fanaticism, but the facts are against him. He cannot laugh facts out of existence. He may shake his head reproachfully at your assertions, but that will not alter the proved certainties of science, nor destroy the evidence which can be obtained from the liquor manufacturers and vendors

themselves. He "may walk in the ways of his heart," and fondle the delightful illusions of his muddled brain; but the verdict of science, the testimony of medical experts, the sad facts of human life, the evidence of the literature prepared for "the trade," all combine to show how fearful are the evils which beset him. The growing strength of his craving for stimulants ought to make him pause, his increasing fondness for them and his diminishing ability to resist the temptation to indulgence in them should lead him to stop, before he becomes the helpless, abject slave of a cruel and destructive tyrant.

The perils of drinking alcoholic liquors may not reveal themselves at first—the pleasure and excitement they produce may probably seem to outweigh the evils ; but a true estimate of the whole case cannot be arrived at from what is experienced by those who have only come to the first stages of the habit. A wise man will form his judgment by what he learns from others, as well as from his own personal experience. He will look into the future, as well as observe the present. He will take all the facts into his reckoning, and not merely those that come within the narrow range of his own ideas and sensations. They who refuse to act this wiser part may for a time pursue their way among the flowers; but gradually the flowers will fade, thorns and briars will spring up, the path will become dark and rough, fears will take shape in the mind, vague and spectral

at first, but terribly real and well-grounded at length. Then he may try to retrace his steps. But the power of habit has now to be reckoned with. It has ruled him too long to be easily dethroned. It has wrapped itself round his very life. Iron fetters are more easily snapped. There is nothing for it but to yield, thinks the poor victim, and he staggers on a little farther, till he dies in despair and darkness. "He goeth after her straightway, as an ox goeth to the slaughter, or as a fool to the correction of the stocks ; till a dart strikes through his liver ; as a bird hasteneth to the snare, and knoweth not that it is for his life. Hearken unto me now, therefore, O ye children, and attend unto the words of my mouth. Let not thine heart decline to her ways, go not astray in her paths : for she hath cast down many wounded ; yea, many strong men have been slain by her. Her house is the way to hell, going down to the chambers of death" (Prov. vii. 22-27).

CHAPTER XXI.

DOES ALCOHOL PREVENT DISEASE?

IN this chapter I wish to consider the question whether alcohol is a protective against the attacks of disease. There are certain substances and methods which are called *prophylactics*, and they are so named because they are made use of for the purpose of preventing disease. Does alcohol deserve to be regarded as a prophylactic?

One of the most terrible scourges of the British Islands is consumption. The lungs especially are affected. They are thrown into a state of inflammation. The cells are bedwarfed and shrivelled, and fatty degeneration is induced. Now, these are precisely the effects that alcohol gives rise to in the lungs. Moreover, consumption arises very largely from bad nutrition; and this, as we have more than once pointed out, is favoured by the use of alcoholic drinks. Alcohol acts first on the stomach and liver, both vitally concerned in the digestion of food; it then affects the lungs, exciting inflammation especially in the forms of bronchitis and pneumonia, and these are frequently the precursors of tubercle or

consumption. Some statistics have been given in a former chapter which show that after consumption has set in life is shorter among the intemperate than is the case with abstainers. Now, we see that alcohol actually predisposes to consumption, and favours tubercular growth. Sir B. W. Richardson is of opinion that there is one form of consumption which owes its origin altogether to habits of intemperance.

In respect to heart-disease, medical men inform us that there has been a startling increase in the number of deaths from this cause during recent years. Fifty years ago there were only one-seventh the number of deaths from heart affections that there are now. Dr. Charles Elam wrote an article in the *Lancet* some time ago in which he emphatically attributed this mortality "to the vicious system of treatment that has become more and more prevalent for many years, and especially to that most pernicious habit of fashion, of giving stimulants largely and indiscriminately"; and he adds, "In affections of the heart there is nothing that so much favours the development of local congestion as these stimulants." Weak action of the heart, and even obstruction of the valves, may be warded off for years by the avoidance of excitement and all such irritants as beget congestion. But alcohol favours these evils in a marked degree. It causes clotting of the blood, and imposes upon the heart an increase of labour which it cannot sustain unless it be perfectly sound. Hence it frequently hastens the fatal termination of a disease that might

otherwise have been either cured, or at any rate robbed of its worst perils.

Medical opinion is quite agreed that cholera finds most of its victims among the intemperate. Alcohol exerts such an influence on the blood, changing arterial or pure blood into venous blood without building up the tissues, and favouring the escape of animal heat through the skin by its action on the vaso-motor system, as we have previously explained, that cholera germs find in the intemperate person a specially prepared victim for their ravages. At one time brandy was always administered for cholera, and was recommended as a preventive in epidemics; but it has now been put beyond doubt that it fosters and promotes choleraic diseases. Dr. Adams, of Glasgow, in a classification of 225 cholera patients, describes only 19½ per cent. of these as temperate, while of the intemperate over 90 per cent. died of the disease. He says: "I have found the use of alcoholic drinks to be a great predisposing cause of malignant cholera. So strong is my opinion on this point, that were I one of the authorities, and had the power, I would placard every spirit-shop in the town with these words: CHOLERA SOLD HERE." A terrible illustration of the liability to cholera to which the intemperate are exposed was given in connection with the outbreak in Liverpool in 1866. The first victim was an Irishwoman; and as is common with such persons, the friends remained in the house drinking all night. Within a short time fifty persons died in the

vicinity of that house. During the visitation of 1848-9 in Edinburgh it was reported that not a single teetotaler was attacked.

The evils caused to the brain and nerves, the breathing organs, the blood, the liver, and some other parts of the body, by the excessive use of alcoholic liquors have already been sufficiently described when dealing with these various organs, and nothing more need be said here in regard to them. But we must not overlook the fact that the kidneys are peculiarly liable to several very painful and dangerous diseases as the result of a continued indulgence in intoxicating beverages. These bodies are made up of an infinite number of minute tubes whose office it is to draw off the waste water of the system, in which are held in solution several kinds of effete matter which are carried away through the ureters (fig. 33, 5). If this waste material be not ejected, it speedily exerts a poisonous influence on the blood and the nervous system. Just as was described in relation to the liver, so the kidneys are subject to a deterioration of their structure from the effects of alcohol. Excess of fat is deposited, the delicate vessels lose their elasticity, and the membranes become so disorganised as to permit of albumen passing through them and thus being cast out of the body, the very material that was designed to build up the tissues being thrown away as refuse. If this stage of kidney affection is once reached, it is as if the very blood is being drained from the system, and life will

be of only short duration. Medical men agree that nearly all cases of kidney diseases originate from alcoholic excess, and the one just described, which is usually called Bright's disease, or albuminuria, is, says Dr. Hargreaves, "rarely met with in private

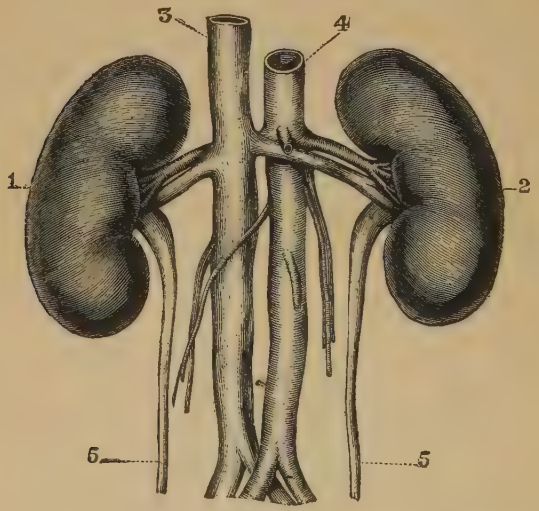

FIG. 33.—Kidneys, 1 and 2; vein, 3; aorta, 4; ureter, 5.

practice unless the patient has been in the habit of regularly using fermented liquors, gin, or whiskey."

Numerous other facts of a similar character are before the world, all tending to prove that most diseases and epidemics owe their severity mainly to intemperance, with its filth and squalor, and insufficient food. It is a matter, then, for national

concern that this drink question should be dealt with, for in it are involved the health and well-being of the entire population. It almost seems a mockery to pray to God in times of epidemic diseases, while we take no pains to remove the cause of them—which might so easily be done.

Evidence of the same kind as that which we have here adduced might be presented in relation to other diseases, but what has been said is more than enough to demonstrate that, while alcohol has no power whatever to guard us from disease, and imparts to our bodies no strength or tone wherewith we might resist an attack, it positively makes us more susceptible to infection, and exposes the more temperate section of the community to dangers which arise from the folly and excesses of their neighbours.

CHAPTER XXII.

MORTALITY AND INTEMPERANCE.

AFTER what has been said about alcohol and disease, the reader will be prepared to believe that the length of life among abstainers is much higher than among the intemperate or even moderate drinkers, and that the death-rate for those who are engaged in the liquor traffic is considerably above what obtains in any other trade.

Dr. Carpenter tells us that the annual rate of mortality for the whole population of England at the age of forty was, for the year on which his calculations were based, about 13 per thousand, while among the lives insured at life offices it was 11 per thousand, and for those insured in Friendly Societies it was about 10 per thousand. In several of the Insurance Companies the rate was from 13 to 22 per thousand. But at the Temperance Provident Institution it was as low as $7\frac{1}{2}$ per thousand.

These figures are all the more significant when we bear in mind that the comparison is between abstainers and moderate drinkers, and not between teetotalers

and drunkards. A drunkard's life is known to be so precarious that no Insurance Office will, except in ignorance, insure his life at all. The low death-rate prevailing among abstainers is now such a well-attested fact that a teetotaler can insure his life at a considerably less premium than that which has to be paid by even moderate drinkers. Not only is the cost of the drink avoided and all the attendant perils of drinking escaped, but the future is provided for at much less expense by those who abstain from intoxicating liquors.

From the statistics published by the United Kingdom Temperance and General Provident Association, we are able to gather that the deaths among abstainers are 26 per cent. fewer than among moderate drinkers.

Sir B. W. Richardson some years ago read certain figures before the Society of Arts which well deserve attention for the light they throw on the question of mortality among public-house keepers. He showed that the number of deaths among innkeepers was much greater than in any other class of persons, and that for every 100 males of the age of twenty-five who died, 147 publicans died, while at the age of thirty-five for every 100 deaths among the population in general no fewer than 157 publicans died. The following particulars will perhaps be easier to understand. They show the number of deaths in one year out of every 1000 persons engaged in the most common industries.

Out of every 1000			farmers	12 died.
„	„	„	shoemakers	15 „
„	„	„	weavers	15 „
„	„	„	blacksmiths	16 „
„	„	„	tailors	17 „
„	„	„	carpenters	17 „
„	„	„	miners	20 „
„	„	„	bakers	21 „
„	„	„	butchers	23 „
„	„	„	publicans	28 „
Out of every 1000 of the whole population				18 „

Still more appalling are the statistics published by the Registrar-General for the years 1880-82, giving the comparative number of deaths in different trades and professions, so calculated as to represent the annual rate of mortality.

For every 1000 deaths amongma les between the ages of twenty-five and sixty-five.

556 clergymen and ministers died.
631 farmers and graziers died.
701 agricultural labourers died.
820 carpenters and joiners died.
891 coal miners died.
969 masons and bricklayers died.
1202 plumbers, painters, and glaziers died.
1361 brewers died.
1521 innkeepers and beersellers died.
2205 public-house and hotel servants died.

In a most useful and carefully written pamphlet on this subject, by Dr. Norman Kerr, entitled "Mortality from Intemperance," the author says: "I was compelled to admit that at least 120,000 of our population

annually lose their lives through alcoholic excess, 40,500 dying from their own intemperance, and 79,500 from the intemperance of others." He tells us that of 55 deaths to which he testified in one year, 13 were owing either to personal intemperance, or to disease or accident arising from the intemperance of others. This would mean for the nation 160,000 deaths, but he prefers to be within the mark. From a record of deaths kept by him which was spread over seventeen years, he found that out of 270 deaths 60 were due to drink. As the number of deaths in the United Kingdom is about 700,000, it would follow that more than 150,000 die annually as the result of alcoholic excess. An annual epidemic sweeping away that number of victims every year would fill us with dismay. A war once in a lifetime leading to that loss of life would be terrible. And yet the decimation goes on, and the nation is unmoved. The population of a town like Leicester or Portsmouth, or of a county like Bedfordshire, is every year destroyed; and yet those who are trying to remedy so gigantic a calamity are smiled at as fanatics! Surely the fanaticism is all on the other side. If only that number of cows or pigs were to die of disease in one year the Churches would be offering special prayers, the Government would forget almost everything else, the entire nation would be agitated. But because they are only human bodies that are perishing, only immortal souls that are ruined, we are calm, philosophic, indolent.

From some figures prepared by Mr. Neilson it

appears that the duration of life after the commencement of intemperance is 21½ years for beer-drinkers, 16½ years for spirit-drinkers, and 16 years for those who drink both, taking as a basis those between the ages of twenty and thirty; whereas according to the usual calculation a person of twenty may expect to live 44 years if temperate, and a man of thirty has a chance to live 36 years longer.

A very interesting bit of history is recorded in Dr. Hargreaves' "Alcohol and Science," which we will condense for the sake of our readers. An Act was passed in 1729 facilitating the sale of liquors in England, when the number of deaths in London rose to nearly 30,000. When the duties were increased, the number of deaths decreased to 23,358, in 1732. But this Act was afterwards repealed, and the deaths again rose to what they were in 1729. In 1757-8 there was a scarcity of grain, and distillation was stopped for three years, when the number of deaths decreased by nearly 4000. In 1760 distillation was resumed, and the deaths increased. In 1796 grain was again scarce, and distillation was suspended, when the mortality in London showed a decrease of 1891. In 1800 there were over 23,000 deaths, which, in 1801, owing to a scarcity of grain, sank to 19,378; and the impositions of higher duties in 1803 caused a diminution both of the consumption of spirits and the number of deaths.

What conclusion can be drawn from all the foregoing facts and figures but that abstainers may reasonably expect to live longer than moderate drinkers?

And not only so, but they will be healthier, happier, and richer than those who sap their strength and impair their bodily and mental powers, and empty their pockets in the foolish and woeful gratification of a degraded and perverted taste. While one man of robust constitution may battle with the destructive effects of alcoholic indulgence, and attain to his threescore years and ten in spite of his being a moderate drinker, ten others will succumb a dozen years earlier, and a few will give way to inordinate excess and drop into dishonoured graves before their course has been half run.

CHAPTER XXIII.

WASTE OF WEALTH BY DRINK.

THERE are grave national aspects of the drink question which deserve to be considered by every thoughtful citizen. Not only the intemperate suffer from their indulgence, but moderate drinkers are affected, and the interests of abstainers even are deeply involved in many ways. The drink bill of the United Kingdom now reaches the enormous sum of over £130,000,000 every year. It is easy enough to write or to read these figures, but it is difficult to appreciate their vast significance or to exhibit their wide-reaching import.

We pay more for drink than would suffice for the rents of all the farms and all the houses in England, Scotland, and Ireland. Our bread does not cost nearly so much as our wines and spirits. We could pay for bread, butter, and cheese for the entire nation with the sum spent on liquor.

But we have not even yet comprehended all that is meant by our national drink bill. It is evident that enormous quantities of food-stuffs, such as grain and sugar, are used up in the manufacture of malt and

spirituous liquors, to say nothing of the fruit destroyed in the making of wine. From the publications of the late Mr. W. Hoyle it appears that the yearly consumption of alcoholic liquors in the United Kingdom is about 16,000,000 gallons of wine, 40,000,000 gallons of spirits, and 1,000,000,000 gallons of ale and beer. The grain used in producing these liquors would be valued at £20,000,000 which is about one-third of what is spent on bread. At least £5,000,000 may be added for grapes, sugar, hops, and various kinds of fruits used in fermentation and distilling. Adding to these items the loss in wages owing to sickness and neglected work as the result of dissipation, the cost of asylums, workhouses, and prisons, the uses of which are mainly to shelter or to punish the victims of intemperance, we reach a total of appalling dimensions, variously estimated at from £250,000,000 to £300,000,000. How soon we could pay off our National Debt if the liquor traffic were extinguished! How easily we could provide old-age pensions for all our artisans and labourers! What abundant support might be rendered to the Churches, the Foreign Missionary Societies, and all other philanthropic institutions!

Dr. Dawson Burns has calculated that the amount of grain destroyed in the production of spirit in our country would suffice to supply a 2-lb. loaf every day in the year to every family in the land.

Another important point is that if those who now carry their money to the publican's till could only be

prevailed upon to spend it on clothing, it would start and keep in full operation every factory and mill in the land. Wages would be higher and more regular, homes would become more comfortable and cheerful, pauperised children would be better fed and educated, and industrial and commercial prosperity would gladden our whole country, now groaning under heavy burdens of taxation, pauperism, and bad trade.

Looked at from the standpoint of the individual, the expenditure upon strong drink will seem to be equally wasteful and deplorable. The moderate drinker will consume at least a gallon of ale in a week, which will cost, say, threepence a day. This sum, small as it is, if laid by at compound interest, would in fifty years amount to nearly £1000, a noble sum, which most hard toilers might secure for their old age by an insignificant amount of self-denial. And in practising that self-restraint they would be far more likely to reach a green and bright old age, in which they could enjoy the fruits of their labour and thrift, than if they continued all their days to rob their brain of its fire and their limbs of strength, by constant indulgence in alcoholic drink.

The assertion is sometimes met with that the capital employed in the liquor traffic affords work and wages to great numbers of working men, and so is really well bestowed. But if this capital were to be invested in other industries the profits would pay wages to far more workmen than are occupied in the drink trade. It has been computed that there are

somewhere about 350,000 persons engaged in the liquor traffic, and the amount of profit accruing from their labour is more than equal to the profits gained by the work of several millions of labourers in other trades. It is the brewer and the distiller, and, to a more moderate extent, the publican, who get the lion's share of the profits, not the workman. A few successful brewers are able to amass princely fortunes, because they are appropriating thirty times as much profit from labour as any other capitalist is able to realise. When the working classes have opened their eyes to facts like these, surely they will be unanimous in requiring some reform in the liquor laws, even if they stop short of demanding entire prohibition.

It is also affirmed by the advocates of the liquor trade that the large sums of money paid for excise duties on spirituous liquors add materially to the national income, and hence the pockets of the taxpayers are saved. Even if this were true, it would be better to have a sober nation, a virtuous people, though poor, than a wealthy community given up to indulgence and pleasure. But statements of the kind we are discussing have not a vestige of truth in them. Nothing is more directly opposed to the principles of a true political economy than the assertion that such industries as the liquor trade add anything to the national wealth. Adam Smith, the father and founder of the science of political economy, declared that "all labour expended in making strong drink adds nothing to the

wealth of the community." And every one has heard of the fine utterance of Mr. Gladstone, who, on one occasion, said, "Give me thirty millions of sober people, and I will answer for the exchequer, I will undertake to have a surplus!"

So far from adding anything to the wealth of the country, the liquor trade is the one cause of all its beggary and rags, its burdensome imposts and taxes, its seething pauperism, and the stagnant condition of its commerce and manufactures. If once this great incubus of the drinking habits of the people could be got rid of, a new era would dawn for Britain; her prosperity would exceed that of her most flourishing ages of the past; her people would experience a contentment and happiness that at present they do not dream of; and the poet's description of her, never yet realised, would at length seem to come within the sphere of the possible, for she would bid fair to become

"Great, glorious, and free,
First flower of the land, and first gem of the sea."

CHAPTER XXIV.

DRINK AND CRIME.

THE close relationship between drink and crime is so well established that no intelligent person now doubts that at least nine-tenths of the offences against the laws of the country are committed under the influence of strong drink. Baron Dowse said, "I find that drink is at the bottom of almost every crime committed in Dublin." And Justice Hawkins declared at Bradford, "I do not hesitate to affirm that the great majority of the crimes that come before me can be traced, either directly or indirectly, to the influence of drink." Justice Fitzgerald attributes nineteen-twentieths of the crimes in England to this cause, and Chief-Justice Coleridge on more than one occasion solemnly averred the same thing.

It is heartrending to contemplate the ill-treated wives, the brutalities practised upon unoffending children, the savage fights of the gin-palace and the beer-shop, the murders committed under the maddening influence of drink, and the many other violations of Divine and human laws which disgrace our nineteenth-century civilisation, and which are the dread offspring

of intemperance. It is with perfect accuracy that the liquor trade has been described as "a costly propaganda of crime."

We understand now well enough how all this may be explained. We know how nerves and brain are excited and reason dulled, how the fear of consequences is drowned and even the will dethroned, until the animal passions, like a mad dog released, foam and rage against all that opposes them. Character, reputation, home, natural affection, parental duty, all are overwhelmed in the ruin into which the confirmed drunkard falls. Link by link the chain of habit is forged, till the victim of alcohol is bound in its adamantine coils. Stage after stage in the hardening process is gone through, till he is dead to every feeling save the intense craving for drink. The very sight of it will scatter all good resolutions to the winds, the smell of it overmaster every purpose and promise to reform. The appetite may become stronger than the restraints of religion, and the professions of a lifetime may be dishonoured by the frailty and temptation of an hour. A member of one of my congregations, with whom I was expostulating on account of his weakness in this respect, stretched out his arm and said, with tears starting into his eyes, "I would give this right hand if I could only get the flaming thirst for drink out of my body." But what a terrible history of yielding and indulgence must have been wrapped up in that awful confession! A professing Christian, over whom I sorrowfully watched for three years and with whom

I had more than once on bended knees sought Divine forgiveness for his relapse into drunkenness, met his death in a public-house struggle by an injury to his brain caused by a fall. Every pastor has been saddened and bewildered by similar cases. What is the meaning of it all, save that the will has become enslaved? When this dreadful stage has been reached there is hardly any crime that is impossible. The brain itself has become diseased, and a diseased brain means an impotent will. The intellect is distorted, the conscience seared, the soul shrouded with despair. Our only safety lies in strenuously avoiding the very beginnings of a habit that may by repetition and encouragement become too strong for us. Of all slavery the most tyrannous is that of appetite; of all weaknesses the most perilous is that which results from constantly yielding to the fascinations of drink; of all insanity the most raging is that of the confirmed drunkard, governed and driven by the debasing and besotting thirst for the cup in which lurks the viper whose poisonous fangs are more fatal than those of any venomous beast.

CHAPTER XXV.

THE HEREDITARY EFFECTS OF INTEMPERANCE.

IT is now well known, not only among the scientific but by the general public, that children often inherit the diseases from which their parents suffered. Even where the actual disease itself is not transmitted, there is often a predisposition to it, some weakness or defect of body or nervous organisation which renders the child more exposed to attack if brought into circumstances which favour the parental disease. All this has been conclusively established in regard to the appetite for intoxicants. It is a depraved appetite, a disease, and it can be handed on from parent to child. Intemperance, then, not only injures or ruins those who are the victims of it, but it sows the seeds of ruin for others. Enfeebled constitutions, weak minds, a tendency to vice, are common legacies received by hapless children from their guilty parents. Most criminals possess a feeble mental or physical organisation, and frequently both. The constant use of intoxicating beverages, even where absolute drunkenness is never reached, will lead to the transmission from one generation to another of a dulled intellect,

a feeble muscular organisation, an undeveloped brain and nervous system, a vacillating will, and a sickly moral nature, all helping to make the battle of life harder to fight, or handicapping the child for the great race which, either with success or failure, must be run. What serious reflections ought all this to awaken in the minds of men and women to whom their children are their most precious possessions! How grave are the problems, and how heavy the responsibilities, which these facts suggest to those who are largely entrusted with the making of laws for the preservation and welfare of society and the nation!

Nature no less forcefully than the Bible teaches us that the sins of the fathers are visited upon the children unto the third and fourth generation.

Sir B. W. Richardson says in his "Diseases of Modern Life": "Amongst the many inscrutable designs of nature, none is more manifested than this, that physical vice, like physical feature and physical virtue, descends in line. But not one of the transmitted wrongs, physical or mental, is more certainly passed on to those yet unborn than the wrongs which are inflicted by alcohol. Many specific diseases engendered by it in the parent are too often stamped in the child; while the propensity to its use descends also, making the evil interest compound in its terrible totality."

As further illustrating this important subject, we may refer to an interesting conversation recorded by Dr. F. R. Lees between himself and a medical

man. The latter had thought that Dr. Lees exaggerated the evils of drink, and referred to a gentleman of his acquaintance who took his bottle of wine every day, and was apparently hale and hearty. "Well," said Dr. Lees, "I should think, then, you have not much to do in this family?" "Oh yes, but I have," he replied. It turned out that five children of the family had died, and of those living one was "touched in the head," another was in an asylum, a third was "queer," and the remaining three were "nervous." Many years afterwards Dr. Lees learned that one of the sons died a lunatic. The father died of apoplexy. The last of his grandsons got through all his money and lived in obscurity on a small pittance.

I am acquainted with a family of which the father was intemperate, and, in consequence, was thrown from a brilliant position, dying at a little over sixty, though apparently strong and vigorous, and of whose five children only one has escaped either lunacy or early death. The secrecies of family life are too jealously guarded to allow of our knowing all the terrible results that the intemperance of parents hands on to their children; but there is enough evidence before the world to put it beyond doubt that the hereditary effects of drinking habits are most lamentable in their nature and quite incalculable in their extent. It is an awful fact, too abundantly demonstrated to allow us to ignore it, much as we could wish to do, that where both father and mother are intemperate

the children are almost sure to be the same. As though their very blood was poisoned, they begin life with the taint of the parents' curse. And many physicians declare that where the craving for drink is inherited it is practically impossible to cure it. There is no remedy save force and confinement. They are safe only when they cannot get the drink. How sad this is! Can we wonder that benevolent persons, who are aware of all these things, should sometimes burn with indignation when they observe men and women filling honourable positions in the world, and desiring that their sons and daughters should inherit their good name, but who, by their own habits of indulgence, are laying the foundation of their children's ruin? Is it surprising that many Christians, seeing the masses of our toiling populations to be ignorant of the hereditary influences of drinking habits, should be so persistent in their efforts to reform the liquor laws of our time, in order that the multitudes of the thoughtless and the selfish may be saved from temptations which they have neither the strength nor the wish to avoid? The best interests of society and of the nation are at stake; the future happiness of our beloved country is involved; nay, the very existence of the empire depends upon the philanthropy and the legislation of to-day. Mighty kingdoms in the past have been undermined by the vices of the people. Babylon, Greece, Rome, the Italian Republics, were all in their time wealthy and powerful. They had almost invincible armies, and navies that swept the

seas. They possessed arts and refinements, and for long periods rejoiced in their supremacy and magnificence. But, weakened by sensuality and voluptuousness, these once flourishing states became the easy prey of more robust and courageous peoples, and have fallen from their place and power. Is it not the duty of every patriotic Briton to seek to save his country from that one dominant vice which, more than any other, threatens to sap our national greatness, and to bring England to the dust?—not that we fear this will ever be, for there are too many among us who are determined it shall not come to pass. Christian sentiment is too strong in our land to permit those who are in authority to remain much longer in inactivity. All the signs of the times betoken the rapid approach of vast and sweeping reforms in the customs and laws of our land, and give promise of the speedy diminution at least of the temptations which now beguile and cajole and ruin so many of our fellow-citizens.

These are among the gravest problems that demand the serious attention not only of the medical profession, but also of the politician, the social reformer, and of every enlightened citizen who claims to be thought patriotic, or a lover of his country and his fellow-men.

CHAPTER XXVI.

JOHN WESLEY ON INTEMPERANCE AND THE LIQUOR TRAFFIC.

WHEN John Wesley lived, a hundred or a hundred and fifty years ago, there was no such feeling about Temperance as there is in our time. Drunkenness was very prevalent and liquor-shops were plentiful, but what condemnation was pronounced upon these was prompted by the anxiety of a few good men for the salvation of the souls of those who were losing the Kingdom of Heaven for the sake of pleasure. It was on moral and religious grounds mainly that drinking was denounced. Alcohol was not then understood as we understand it. Almost every one at that time took it for granted that wine and beer were beneficial and nutritious; hence it was the excessive indulgence in them that was usually reproved, and not their moderate use. There were no chemists and physiologists in those days to teach the people what fermentation was, and what were the baneful effects of alcohol on the organs and vital processes of the human body. There were practically no other beverages then save water, and

this was often none of the best. Besides which, brewing was done at home in a large measure, and the malt liquors thus made were quite destitute of the harmful adulterations which characterise many of the modern concoctions sold as "ale" and "beer." Nevertheless, the drinking of "drams"—that is, spirituous liquors, ardent spirits—was considered to be injurious, and was by most intelligent persons frowned upon.

Nothing more strikingly exhibits the sagacity of John Wesley than the attitude he took up in regard to the drinking customs of his time. He was far ahead of his age. Bearing in mind the description just given of the common opinions and habits of his day, it is astonishing to find in Wesley's writings expressions of judgment in regard to intoxicating beverages almost as advanced as those with which we have been made familiar by the scientific students of alcohol of our own time.

In his sermon on "The Use of Money," he indicates some of the methods of unlawful gain, and among these he enumerates the making and selling of spirits. He says: "Neither may we gain by hurting our neighbour in his body; therefore we may not sell anything which tends to impair health. Such is eminently all that liquid fire, commonly called drams, or spirituous liquors. It is true these may have a place in medicine (although there would be rarely any occasion for them, were it not for the unskilfulness of the practitioner); therefore such as prepare and sell them only for this

end may keep their consciences clear. But who are they who prepare them only for this end? . . . But all who sell them in the common way to any that will buy are poisoners-general. They murder his Majesty's subjects by wholesale, neither does their eye pity nor spare. They drive them to hell like sheep. And what is their gain? Is it not the blood of these men? Who, then, would envy their estates and sumptuous palaces? A curse is in the midst of them. Blood, blood is there: the foundation, the floor, the walls, the roof, are stained with blood. And canst thou hope, O thou man of blood, though thou art clothed in scarlet and fine linen, and farest sumptuously every day—canst thou hope to deliver down the fields of blood to the third generation? Not so, for there is a God in heaven; therefore thy name shall be rooted out, like as those whom thou hast destroyed, body and soul."

We who are accustomed to the modern pulpit can scarcely realise that more than a century ago these denunciations were thundered out by one of the truest, wisest, and tenderest men that ever lived. Would that our pulpits more frequently rang with words like these! And yet the evils of intemperance are no less rampant now than during the life of Wesley, the habits of multitudes are as debased, the gain realised from this traffic in blood and souls inconceivably more vast.

Mr. Wesley had sufficient penetration to perceive that alcohol was a poison, though he had not nearly such good grounds for this description of it as we

have. In a letter to one of his preachers he says: "Taste no spirituous liquors, no dram of any kind, except prescribed by a physician. Touch no dram: it is liquid fire. It is a sure but slow poison. It saps the very springs of life."

He firmly maintained that spirituous liquors exerted a pernicious influence on the health and vigour of the body, although at that time the great majority believed the reverse of this. As is well known, Mr. Wesley gave much attention to the laws of health, and was thoroughly versed in what medical science there was in the eighteenth century. Writing on Nervousness, he refers to the influence of spirituous liquors in this and other maladies, and asks, "What are the causes of this strange disorder?" His reply is, "One cause is the use of spirituous liquors. This is one of the horrid effects which naturally follow that fashionable poison. That liquid fire lays the foundation of numberless diseases, and of this in particular."

So profoundly did Mr. Wesley believe all this, that he forbade his preachers to drink spirituous liquors; and, as already stated, he would not retain in church membership any who made or sold them, while he strongly urged all his members to cease drinking them. On one occasion he saw Mrs. Fletcher, of Madeley, offering wine to one of his preachers who had been conducting a service, and he at once stopped her by asking, "What, madam, do you intend to kill my preachers?"

There is just one passage in Mr. Wesley's writings

which seems to countenance the drinking of mild beer. The words are : "Drink only water, if it agrees with your stomach ; if not, good, clear small beer. Water is the wholesomest of all drinks ; quickens the appetite and strengthens the digestion most. Malt liquors (except clear small beer, or ale of due age) are exceeding hurtful to tender persons." We may cheerfully make a present of this passage to the alcoholites. Small beer would have about the same quantity of alcohol in it as we might find in lemonade or ginger-ale ; but water is better than this, says Mr. Wesley, save for those of tender stomachs.

It is interesting to notice what Mr. Wesley's own practice was in regard to this matter. He was perfectly consistent with his rules and advices. He rigidly abstained, from an early period of his career, as the following quotation will show : "I began to abstain about twelve years ago. . . . But I resumed the use thereof about two years ago, for the sake of some who thought I made it a point of conscience. Dr. Cheyne advised me to leave it off again, assuring me, 'Till you do, you will never be free from fevers' ; and since I have taken his advice, I have been free (blessed be God) from all bodily disorders." If Mr. Wesley lived now, he would not hesitate about making abstinence a point of conscience, if, indeed, this was not actually so in his later life.

The testimony, then, of Mr. Wesley's teaching and practice is clear and conclusive. He held water to be the safest drink, "the best diluter of food .. he re-

garded all intoxicants as poison, and only to be taken in extremely small doses and under exceptional circumstances or by medical advice. He scrupulously abstained himself, and held that it was better for health to do so, while he again and again denounced those who made gain by trafficking in spirits, and on more than one occasion expostulated with ministers of the State for enriching the national exchequer with money obtained from a trade which corrupted the morals of the people and threatened the progress and prosperity of the kingdom. Here, indeed, we have the picture of an enlightened politician, a true philanthropist, a scientist far in advance of his generation, a Temperance reformer who was not one whit behind the most ardent and enthusiastic teetotaler of our own age. It was no misstatement of fact when Richard Watson, in his "Life of Wesley," declared that "the Methodist societies were the first temperance societies." They bid fair, we are thankful to say, to become once more what they used to be. It is rare to find a minister who is not an abstainer. During my college days it was not thought wrong to place jugs of beer on the dinner table, and the long lines of tumblers were variegated here and there with suspicious colours. I have dined there often since, and the jugs never appear, while the glasses are all clear and sparkling. Total abstinence is the watchword of Methodism, and there are signs that it will not be long before it will be as difficult to find a non-abstaining member of our Church as it now is to find a minister who is not a teetotaler.

CHAPTER XXVII.

THE BIBLE AND TOTAL ABSTINENCE.

THERE are good reasons enough for dreading the terrible power of alcohol and for abstaining altogether from the use of intoxicating beverages, even without any reference whatever to the teaching of the Bible. But Christians are sure to feel a desire to know what this best of books, their one guide in morals, has to say on a matter of such vast importance as the drink question. Scripture texts are frequently quoted on the one side or the other in the discussion of Temperance topics. It will be well for us, then, to try to get a right idea as to what the Bible has to say on the subject of wine-drinking.

In the first place it must be pointed out that there are various kinds of wine mentioned in the Bible.

Yayin is the most common, and evidently includes both fermented and unfermented kinds. In Prov. xx. 1, "wine is a mocker," it is clearly the fermented kind that is referred to. So also in Prov. xxiii. 32, "at the last it biteth like a serpent and stingeth like an adder." In verse 31, the phrase "giveth its colour in the cup," is literally, "its eye in the vessel,"

in allusion to the bubbles of carbonic acid gas which it gives off during fermentation. This word "*yayin*" occurs 141 times in the Old Testament. In Deut. xxxii. 33 it is called "the poison of dragons and the cruel venom of asps." Most commonly *yayin* is mentioned in a bad sense, as in Jer. xxiii. 9, "I am like a drunken man, and a man whom *yayin* hath overcome." But sometimes it is used without condemnation, as in Isa. lv. 1, "Come, buy *yayin* and milk without money and without price." It is also spoken of as part of the tithe, in which case it must have been the newly pressed juice, for vegetable tithes were brought at the time of gathering and offered at the sanctuary. Hence it is clear that *yayin* meant wine in general, and we have to gather from what is said of it whether it refers in any particular passage to fermented wine or the pure expressed juice of the grape.

Another word, *tirosh*, is variously translated "wine," "new wine," and "sweet wine." It is never spoken of as doing harm. It is indeed said, in Zech. ix. 17, "to make the maids cheerful." But the same thing is said of corn, and an old writer tells us that the Arabs are as delighted with a ration of oil and corn as if they had drunk a bottle of wine each. This word would seem to denote a desirable possession, for it is evidently related to the word "*yarash*," which implies possession. In the East, vineyards and grapes were among the most valuable things. The vine and its fruit are constantly referred to in the Bible, as well as

other books, as being a most important part of the wealth of a country and the possessions of individuals. "Corn, wine (*tirosh*), and oil" is a frequently occurring phrase. *Tirosh* is that which, when trodden, produces wine, as is distinctly affirmed in Micah vi. 15: "Thou shalt tread the olives, but thou shalt not anoint thee with oil; (and thou shalt tread) *tirosh*, but shalt not drink wine (*yayin*)." Here *tirosh* and *yayin* both occur, and in such a way as to show that *yayin* means "grape-juice," and *tirosh* that which must be trodden to produce the grape-juice. Whatever the Bible says about *tirosh*, therefore, this can afford no ground for affirming that the Scriptures sanction the drinking of fermented liquors.

Shekar is usually rendered "strong drink." It seems to be the word from which our "sugar" is derived; hence it may denote a sweet drink, or weak wine. The word *sikir* has been discovered on an ancient Egyptian monument four thousand years old, where it has the meaning of "fruit-syrup." It was probably a naturally fermented wine, but even in this mild form its use is condemned by the Bible, and it is associated with woe and sin (see Isa. v. 11, 22; xxviii. 7). In Hab. ii. 15 we find these solemn words: "Woe unto him that giveth his neighbour drink (*shekar*), that puttest thy bottle (*khemah* = poison) to him."

Ahsis occurs five times, and is translated "wine," "new wine," "sweet wine." In the Song of Solomon (viii. 2) it is used of the juice of the pomegranate.

Amos (ix. 13) refers to *ahsis* as a sign of fertility, and it is associated with the treading of grapes, thus indicating that it is the newly pressed and unfermented juice of the grape that is meant. In Joel iii. 18 it is said, "the mountains shall drop down new wine," where the meaning is evidently the same as in Amos ix. 13, just referred to. The phrase "drunken with their own blood as with sweet wine" (*ahsis*) merely means that as large quantities of sweet wine, or *must*, are generally drunk, on account of its being unfermented, so the enemies of Israel shall be overwhelmed with blood. The word is derived from a root meaning "to tread"; hence it clearly refers to the juice obtained by treading the grapes.

Matzoth, from *matzah*, "to wring out" (Exod. xii. 15, etc.), indicates the sweet juice wrung out of grapes.

Soveh, or *sobe*, "boiled wine," "drink." In two passages the word means an unintoxicating wine (Isa. i. 22; Hos. iv. 18), and in Nahum i. 10 probably an intoxicant, the *syr*, or cauldron, in which it was prepared being mentioned.

Khometz means "vinegar," and hence denotes a fermented fluid. A similar word, *khametz*, is translated "leaven" in Exod. xii. 15, etc.

Ashishah seems to have been a sort of fruit-cake made of dried and pressed raisins, and used pretty much in the same way as apple-cake now is in the East. It comes from a root meaning "to press."

Khamar and *Khamrah* are the Chaldee forms for *yayin*, and include all sorts of wine, fermented and

unfermented. In Ezra vii. 22 unfermented wine is intended, and in Dan. v., which describes Belshazzar's feast, fermented. This word is used only by these two prophets, in whose writings many Chaldee words occur. A similar word in Deut. xxxii. 14 means "fermenting."

In the New Testament the commonest word for wine is *oinos*, which occurs thirty-two times, and evidently includes all kinds of wine. *Gleukos* means "sweet wine" or "new wine" (Acts ii. 13, etc.). In the Greek Old Testament, *yayin*, in Job xxxii. 19, is translated by this word, showing that those ancient translators took the Hebrew *yayin* to include every kind of wine, fermented and unfermented.

Sikera (Luke i. 15) is rendered "strong drink." In this passage both *oinos* and *sikera* occur; hence we conclude that John the Baptist abstained from both fermented and unfermented wine. The Bible, however, does not condemn the use of grape-juice. The prediction concerning John the Baptist was that he should take the Nazarite vow; but this would not apply to men in general.

The purpose of the foregoing list of words is to show that there are many Hebrew and Greek words in the Bible which are translated in the English Version by "wine," "strong drink," and the like. In any argument based upon the Bible, therefore, we must be quite sure that we understand in what sense the word in question is used; and if the word is one of those which, like *yayin*, include every kind of wine,

we must inquire from the context the precise significance which it bears in the passage under consideration. This we can fearlessly affirm, that there is no instance in which the Scriptures advocate or favour the drinking of intoxicants. And where wine is referred to without condemnation it is impossible to prove that fermented wine is meant.

Secondly, we must guard against the fallacy of supposing that because good men mentioned in the Bible used intoxicating drinks, therefore the Bible sanctions them. Noah became drunk ; but would any one have the hardihood to say that the Bible recommends drunkenness ? On the contrary, it declares that no drunkard shall enter into the Kingdom of Heaven. But, says an objector, Noah drank *yayin*, and in Isa. lv. 1 we are invited to come and obtain this " without money and without price." Quite so ; but it is joined with milk, and hence arises a practical certainty that it meant the natural product of the grape : *yayin*, as already stated, being often used in this sense.

Many other words in the Scripture occur in a similarly general sense, the context enabling us to decide their precise significance in the passage under examination.

The making of wine at the marriage feast in Cana of Galilee is often utilised for the purpose of gaining the authority of our Lord for wine-drinking. I have never yet heard any one prove that Christ made intoxicating wine, and I refuse to believe that He did.

He would never create what His Bible called "poison." It was the "best wine" everybody said; hence it was different from the noxious liquor of which they had been partaking. What nature does in a year He accomplished in a moment; but that He added to nature's operations and imitated man's invention by causing the wine to ferment—that is, decay—is incredible.

As to the use of wine by our Lord at the Last Supper, only a word or two need be said. None of the evangelists, in their history of the incident, make any mention of wine. It was "the fruit of the vine" that our Lord distributed. St. Paul, in his reference to the event, similarly avoids the word "wine." Grapes could easily be kept in that country from the previous vintage, and it is known that the Mosaic law required the absence of all fermented articles from the Passover feast. Even the bread had to be "unleavened." Those Jews who are exact in their adherence to the prescribed ritual, are accustomed to use a beverage prepared by pouring boiling water upon raisins.

The only other instance in which an inspired writer appears to have advocated wine-drinking is that of St. Paul, who recommended Timothy to use a little wine for his stomach's sake. Nothing is said as to the kind of wine, and we know that then and ever since unfermented wine has been far more largely used in the East than the spirituous kind. St. Paul was prescribing a remedy for Timothy's ailment, and

whatever the wine was he took care to limit the dose to "a little." There are stomachs much stronger than Timothy's which can endure a great deal; but Paul was too wise to deal with Timothy's stomach as many deal with their "often infirmities." It is evident Timothy was an abstainer. Some explain "little wine" to mean "weak wine," wine mixed with water. But there is no need for any such interpretation. The Apostle is merely advising Timothy, who was an ascetical Nazarite, not to refuse to take a little medicine when he was unwell, just as a modern physician, who was an abstainer, might administer to a teetotaler, with the consent of the patient, a limited quantity of some suitable stomachic or stimulant. For those who have nothing the matter with their stomachs, save what alcoholic drinks have inflicted on them, to suppose that this advice of St. Paul warrants them in drinking a great deal of wine every day of their life, is a very extraordinary piece of reasoning, which, however, does not impose upon the intellect that is undisturbed by the fumes of alcohol.

Thirdly, where the Scriptures refer distinctly and unmistakably to intoxicating drinks, it is in the way of disapproval of their use. The Nazarite institution was especially favoured by God (Numb. vi. 1-4), and the chief feature of the Nazarite vow was that no wine was to be drunk, nor even vinegar. Again, in Lev. x. 8-11, the Lord expressly forbids wine to be drunk by priests engaged in His service; and the reason given for this injunction was lest by taking

strong drink they should fail to put a difference between the clean and the unclean, the holy and the unholy.

The whole teaching of Jesus Christ and the very spirit of the Gospel are, in effect, a rebuke against indulgence in that which works so much harm to our fellow-creatures. I will not say we cannot be Christians without being abstainers, but we can certainly be better Christians, more useful, more successful in finding our way into the hearts of the tempted and the fallen, by showing them an example of self-sacrifice—if indeed it *is* a sacrifice to give up a drink that, on all grounds, we are better without. We may contend for our Christian liberty, but the truest, noblest freedom is that of the man who voluntarily denies himself for the good of others and for the sake of Christ. It is by Christian influence that the abominations of the drink traffic are most likely to be destroyed, and every Christian must settle for himself whether he will do his best to bring this about, or by a weak indulgence deprive himself of all power to help in a Holy Crusade. If our Lord had seen what we see, would He not have spoken as indignantly against the sellers of drink as He did against the hypocrisies and sins of His day? Would He not have pronounced woe on the blind leaders of the blind, who, to enrich themselves, are causing so many hapless ones to fall into the ditch? If St. Paul had witnessed the debaucheries of our large towns, the pauperised crowds, the embruted sots, and the neglected, starving

children that swarm around us, the sad fruits of the unwieldy liquor traffic which has fastened upon the very vitals of our domestic happiness and our national prosperity, would he not have burned within him, and counted all things but loss that he might throw down this formidable obstacle to the salvation of mankind? He could eat meat offered to an idol without defiling his conscience; but the lawfulness of enjoyment influenced him far less than the expediency of self-denial for the good of others. Self-gratification weighed less than a feather with him where the welfare of others' souls was in the balance. "If meat make my brother to offend, I will eat no flesh while the world standeth, lest I make my brother to offend." "It is good neither to eat flesh, nor to drink wine, nor anything whereby thy brother stumbleth, or is offended, or is made weak." These were the magnificent principles that guided St. Paul in all things. They express the spirit of Christ who "pleased not Himself"; and they must enter into and control the lives of all who claim to be imitators of Christ. Our own safety, the well-being of our children, the strength and success of the Church, the good of society, the elevation of our perishing fellow-creatures, the salvation of the world—all are dependent on the measure in which these principles actuate our lives and determine our habits and conduct. While the Christian is confronted with the fact that more than three millions of paupers are dragging out their miserable existence among us, of whom the vast

majority are crushed into the gutter and kept there by the giant Alcohol; while he is conscious that nearly a million drunkards are reeling and staggering through our streets, that the gaols and asylums are filled with recruits from this appalling army, and that through England's pernicious example whole nations are being corrupted and decimated; can he remain unmoved, or refuse to take his part in so tremendous a conflict as that which is being waged with drink? These are questions which every Christian must answer for himself. May God help us all to give a true answer, one that will satisfy our own consciences and retain for us our self-respect and the favour and blessing of our God!

CHAPTER XXVIII.

THE BILL OF INDICTMENT AGAINST ALCOHOL.

TO enable the reader to take in at one view the whole significance of the many reasons we have adduced for avoiding the use of intoxicating liquors, we now present a summary of the facts and arguments with which we have been occupied in the foregoing pages.

Alcohol is not found in nature, nor in natural foods, and animals do not willingly take it.

It is not a creation of God, but the manufacture of man, and is made by the destruction of much valuable food.

It is the product of decay, and is allied to the waste caused in the body by disease germs.

In itself it affects for evil every bodily organ with which it comes in contact, and in the various forms in which it is sold it is adulterated with many noxious and poisonous substances.

It is not food, for it neither builds up animal tissues nor generates force or heat.

It does not economise food, but hinders the production of energy and lowers physical and mental vigour.

It is not a solvent of food, as water is, but robs the body of the fluids needful for this operation, and injures the glands which secrete these fluids.

It destroys the proper effect of the saliva by counteracting its agency.

It hardens foods by taking up the water they contain.

It injures the stomach by drying and inflaming its delicate structures.

It destroys the gastric juice by precipitating the *pepsin*, which is its active principle.

It injures the mucous membrane of the stomach and promotes cancerous growths.

It interferes with the functions of the pancreas and lowers the value of the pancreatic juice.

It causes grave disorders in the liver and sets up fatty and fibrous growths therein.

It obstructs the passage of the blood through the liver and favours dropsy in the abdomen.

It leads to the thickening of the bile and so prevents the perfect solution of fatty foods in the abdomen.

It deadens the *villi* of the intestines and thus causes them to act imperfectly in absorbing the digested food.

It arrests the taking in of oxygen by the lungs, and gives rise to inflammation in the breathing organs.

It accumulates carbonic acid gas in the system, which is a deadly poison to animals.

It favours consumption and other lung diseases.

It unduly excites the heart, putting more work on it than is proper, and hence causes palpitation, valvular derangement, and other heart affections.

It interferes with the formation of fibrin in the blood, thus making wounds more difficult to heal.

It causes the blood-corpuscles to shrivel and die, and so reduces the quantity of oxygen which it is their office to convey to the body, as well as preventing the elimination of carbonic acid gas, which these corpuscles are designed to effect.

It disturbs the circulation of the blood by depressing the vaso-motor nerves, thus causing determination of the blood to the surface of the body, with consequent blotching of the skin and loss of animal heat.

It rapidly passes from the stomach to the spinal cord and brain, and sets up many disorders therein.

It lowers muscular energy and activity, of which the spinal cord is the centre.

It interferes with the proper action of the skin-nerves and skin-muscles.

It destroys the delicate nerve-matter which generates thought and controls all mental life.

It promotes brain disease, and hence originates some of the worst forms of insanity.

It tends to foster habits so strong that even the conscience and the will are dethroned.

It paralyses the nervous fibres, and so interferes with all the vital and organic functions of the body.

It gives rise to unnatural nervous excitement for a time, which ends in dulness, torpor, and indolence.

It cures no disease, but delays recovery and creates a sense of false security in the midst of serious dangers.

It is not a true stimulant, for it has no properties of food, nor can it impart force or tone to any bodily organ.

It has lost its reputation among qualified medical men either as a medicine or a stimulant.

It is a poison, for it disturbs bodily functions, it destroys animal tissues, it impairs the blood, and robs the nerves and brain of their force and vitality.

It is not a prophylactic, for it wards off no disease, but renders those who use it more liable to attack and less able to recover when they are attacked.

It is especially injurious in cases of indigestion, heart disease, liver and kidney complaints, consumption, cholera, fevers, and brain disorders.

It shortens the duration of life and increases the cost of life-assurance to moderate drinkers, while it renders it nearly impossible for the intemperate to obtain any policy of life assurance.

It leads to an enormous waste of individual wealth and national resources.

It is an enemy to thrift, prudence, and philanthropy.

It gives to the brewer far more than his fair share of the profits of labour, and affords only a thirtieth part of the wages that would accrue from the same amount of capital if devoted to any other industry.

It is the cause of nine-tenths of the crime of our land, and breeds poverty and distress of the most degrading kinds.

It transmits to the children of the inebriate a predisposition to intemperate and vicious habits, thus laying the foundation of future pauperism and crime.

It threatens the best interests of society, the State, and the Church; leading multitudes into moral and spiritual ruin, causing wholesale Sabbath desecration, hindering the conversion of the heathen, and casting shame and reproach on the English name throughout the world.

It is in opposition to the spirit of the Gospel and the teaching of Jesus Christ, and does more than all other evils put together to retard the fulfilment of God's gracious purposes of redemption.

This is the terrible bill of indictment that we enter against alcohol, and it is not one whit too severe. The sorrow and the sin which it causes are beyond all power of calculation. Yet such is the faith of the average Englishman in the good qualities of his favourite beverage, and such is its power to cast a spell over the judgment and reason of those who have cultivated the taste for it, that multitudes are willing for the sake of it to run all the tremendous risks here enumerated, and are ready to sacrifice health, wealth, reason, home, wife, children, the soul itself, rather than be deprived of its enjoyment.

Assuredly, then, all right-minded and thoughtful persons, all who care for their own best interests or who desire the welfare and happiness of others, will join heartily in the prayer:—

"From the curse and folly of strong drink,
GOOD LORD, DELIVER US."

THE CONTROL OF THE TRAFFIC.

By the REV. G. ARMSTRONG BENNETTS, B.A.

IN very early days wise statesmen in England began to see the necessity for putting restrictions upon the sale of intoxicating liquors. Edgar the Peaceable reduced the number of alehouses to one in each village, and had pegs put in the drinking-cups to mark how much any person might consume at a single draught. After this the trade was allowed to go on without much interference until the end of the fifteenth century. In 1494 power was given to any two justices to stop the common selling of ale. But the first licensing law was that of 5 & 6 Edward VI. (1551-2). Parliament complained that "intolerable hurts and troubles to the commonwealth of this realm doth daily grow and increase through such abuses and disorders as are had and used in common alehouses, or other houses, called 'tippling houses.'" Accordingly Parliament enacted a measure which has been the basis of our law on the question ever since. Three main principles are fixed by that Act, viz. :—

(1) That the liquor traffic is too dangerous to be allowed to be carried on without limitation, and that it must consequently be restricted to duly licensed persons ; (2) that justifies of the peace shall have the power of granting licenses ; (3) that magistrates shall have the power, when they think fit, of taking away licenses.

The space at our disposal will not permit of our giving a history of licensing in Great Britain between then and now, but we must come down at once to our own period. In the middle of the last century things had come to a terrible pass, and the fearful prevalence of drinking led the Government in 1736 to pass the famous Gin Act, which imposed an annual fee of £50 for a license to sell spirits, and the penalty for breaking the law was a fine of £100. But illicit trade in gin succeeded in evading the vigilance of the Government officials, and the law was practically inoperative, so that in 1742 the Act was repealed.

In the midst of the prevalent intemperance of the last century the Rev. John Wesley took a very firm stand. The Methodist Society, established in 1739, was the first distinct organisation which formally combined against intemperance, one of its rules, which has never been repealed, prohibiting "drunkenness, buying or selling spirituous liquors, or drinking them, unless in cases of extreme necessity." So that Wesleyan Methodism has a temperance stone in its very foundations. It is true that this rule did not refer to fermented liquors, but it none the less recognised the duty of Christians to abstain from beverages which were dangerous to the public morality. In most matters of moral and social reform Mr. Wesley was far in advance of his age, and in his sermons and writings he dropped the seed-corn, the beginnings of the harvest of which we now behold. It is not too much to claim him as the pioneer of the Temperance

movement. In the midst of that awful plague of gin-drinking to which we have just referred, he lifted up his voice and spared not. It is interesting to observe that he anticipated the method of prohibition by legislation which is now regarded by all the most enlightened Temperance men as the proper goal ot statesmanship in relation to this subject. In 1773, during a period of great scarcity and terrible poverty, his remedy for the distress was "*by prohibiting for ever, by making a full end of that bane of health, that destroyer of strength, of life, and of virtue,—distilling.*" *

The next date of importance in the history of the English licensing laws is the year 1828, when all the legislation concerning public-houses was consolidated and the control of them made more stringent. But this wise measure was followed in 1830 by the Beer Act, which permitted any householder to sell beer on paying an excise fee of two guineas. The plea for this Act was that it would lessen drunkenness by diminishing the consumption of spirits. Its effects were disastrous in the extreme. The number of houses for the sale of intoxicants rose at once from 88,930 to 123,396. During the ten years prior to the passing of this Act the quantity of malt used for brewing was 268,139,389 bushels ; during the ten years immediately succeeding it was 344,143,550. Side by side with the enormous increase in beer-drinking, the consumption of spirits went up also.

* See tract entitled "Thoughts on the Present Scarcity of Provisions," *Works*, vol. xi., p. 53.

During the ten years preceding the Beer Act the quantity of British spirits consumed was 57,970,963 gallons; during the next ten years it rose to 76,797,365 gallons, thus showing that the consumption of the less highly alcoholic liquors only creates a craving for the stronger.

Notwithstanding the experience of the Beer Act, the notion of counteracting drunkenness by encouraging the drinking of the less highly charged liquors is an error that is constantly cropping up. Acting under the same delusion in 1861, Mr. Gladstone passed what is commonly known as the Act for Grocers' Licenses, permitting persons to sell wines and spirits in bottles for consumption off the premises. In association with the license provided for by this Act there is commonly held the "beer off" license, permitting its holder to sell beer in bottles for consumption off the premises. The latter license differs from the former in this particular, that the magistrates have full control over the "beer off" license, but they have no power of refusing the license for wines and spirits to any shopkeeper who can comply with the excise requirements. There can be no doubt that the grocer's license has been an unmixed evil, giving increased facilities for obtaining drink to persons who would have shrunk from going to the public-house to get it, and unquestionably it has largely contributed to the increase of drunkenness amongst women, which is now one of the most appalling forms of the drink evil.

We thought it better to give a brief outline of the

national license system without turning aside to notice other aspects of legislation in relation to the liquor traffic, which in chronological order would have come before some of those which we have already noticed. We must now turn back to consider these.

As we have already indicated, the Methodist Revival was the beginning of the modern Temperance movement, as indeed of most of the great philanthropic enterprises which are the glory of the last hundred and fifty years. The forces of Temperance reform which were set in vibration by the strong teachings of John Wesley upon this subject came to a climax in the early years of this century, and found a sort of focus about the year 1832, when total abstinence societies, which had only existed before then in a few isolated cases, began to be established throughout Great Britain and Ireland, and the United States of America. Very soon after teetotalism had begun to take root, it produced in the minds of Temperance reformers a strong conviction that it was necessary to restrict the traffic by law much more effectively than had ever been done; although, as we have already pointed out, our license system grew out of the consciousness of English statesmen that the traffic is a dangerous one, not to be freely legalised, but to be carried on under the ban of restriction.

When Temperance men began to turn their attention to the question of legislation, it became evident to them that the only way in which the State could effectually grapple with the prevalent evil of drunken-

ness was by the plan which Mr. Wesley had advocated long before, viz., the entire prohibition of the traffic. It was in the State of Maine, in America, that the ideas of prohibition began to crystallise into actual legislation. In 1837 the Maine Legislature reported thus: "Your Committee are not only of opinion that the law giving the right to sell ardent spirits should be repealed, but that a law should be passed to *prohibit* the traffic in them, except so far as the arts or the practice of medicine may be concerned." Through the energy and determination of General Neal Dow, who was born in 1804, and who is still alive, the principle which was thus introduced into the realm of politics in Maine developed into a series of enactments, the first of which was in 1846. This Act was a failure, for it only dealt with ardent spirits, and did not contain adequate provision for enforcing its enactments. General Neal Dow, however, through much reproach and persecution, stuck to his point until in 1857 a stringent prohibitory measure was placed on the statute-book, and has never been repealed. In 1884 prohibition was made a part of the Constitution of the State of Maine, which means that no movement can be made for its repeal except by a vote of two-thirds of the Legislature, after which a proposition for its repeal as a part of the Constitution must be put before the electors at the next general election of representatives, when a majority carries it. According to the Maine law, the manufacture, sale, or keeping for sale, of intoxicating liquors is absolutely

prohibited, under severe penalties. The opponents of prohibition are constantly endeavouring to cast discredit upon the value of the law, by bringing forward cases of its infringement. But what laws are not broken? Would any sane man argue that the laws against theft and murder are useless because theft and murder still exist? No one who will investigate the facts can doubt that prohibition has been an immense boon to Maine. In 1857, a few years after the law came into force, there were only eleven savings banks in the State, with 5000 depositors, and a total of deposits and accrued profits of about a million dollars. In 1882 there were fifty-five savings banks, with 99,000 depositors, and an estimated aggregate of deposits and accrued profits to the amount of at least 30,000,000 dollars. Pauperism has shown a steady decrease. From 1860 to 1870, in spite of an increase in the neighbouring states, the number of recipients of official charity was diminished by 21·4 per cent.; from 1870 to 1880 there was a further diminution of 11·6 per cent.; and from 1880 to 1890, in face of the fact that for the whole of the United States there was an increase of 10 per cent., in the State of Maine there was a further reduction of over 20 per cent. Crime also is steadily on the decrease, the number of criminals in Maine being less in proportion to the population than in any state of the Union. The number of convicts in the State Prison is now less than at any time for twenty-seven years. In 1890 there were sixty-five convicts; in 1891 fifty; in 1892 thirty-four.

Prohibition ideas have made considerable progress in the United States. Maine, Kansas, Vermont, North and South Dakota, and New Hampshire have all adopted some form of prohibition, the success of which is in proportion to the stringency of the laws. Iowa and Rhode Island have receded from prohibition.

Soon after the initiation of the movement for prohibitive legislation in the United States, the Temperance workers of this country began a movement in the same direction, as a result of which the United Kingdom Alliance for the total and immediate suppression of the liquor traffic was founded on June 1st, 1853. Sir Wilfrid Lawson has been the Parliamentary leader of the Alliance party in the House of Commons, where, for many years, he has steadily and sturdily contended for the principle of giving the people the direct veto over the liquor traffic—that is to say, that the people shall, by direct vote, have the power of saying whether or not they will have the traffic in their midst. For many years he introduced again and again his Permissive Bill, which was a complete measure, providing all the machinery for applying this principle. But after some time he determined to test the feeling of the House of Commons by a resolution concerning the principle alone. Such a resolution passed the House of Commons on June 18th, 1880, by a majority of 26; in 1881, by a majority of 42; and in 1883, by a majority of 87. At last, after a long struggle, the Liberal party have adopted the principle of the Direct Veto as a part of their programme, and during the

Parliament which assembled on August 4th, 1892, Sir William Harcourt introduced in the name of the Government a Bill called the Liquor Traffic (Local Control) Bill, which proposed to give the people the power of the direct veto over all licenses, except those of *bonâ fide* victualling houses, on the condition that the veto should be carried by a two-thirds majority of those voting. The Government had, however, only a very small majority in the House of Commons, and were compelled to dissolve Parliament in July 1895. The Local Veto Bill was not one of the measures which the Government carried during their short term of office.

During the period of this agitation on behalf of prohibition the Houses of Parliament have had before them a large number of measures for lessening the evils of the drink traffic. Perhaps the most important of these was a measure introduced in 1871 by Mr. Bruce (now Lord Aberdare). His measure was a scheme for a gradual reduction of mere drinking houses to a minimum of, in towns, one licensed house for 1500 of the population and under, two houses up to 3000, and after that, one more for every additional 1000; in the country, one licensed house for 900 people and under, two for up to 1200, three for up to 1800, and one more for every additional 600 people. Temperance politicians refrained from offering direct opposition to this Bill. The trade rose in fury against it, and, as the Temperance party gave it only a sort of neutral support, it was withdrawn. As matters

have turned out, it is unfortunate that the friends of temperance did not support a measure which would have effected a considerable reduction in the number of licenses. No one was, however, to foresee at that time the fortunes which were to befall the Liberal Party, and every fair critic must admit that there was then a fair prospect that the Direct Veto might soon become law.

During this period, proposals for compensation have greatly impeded the progress of temperance legislation. In 1888 Mr. Ritchie inserted in his Local Government Bill clauses for handing over the whole business of licensing public-houses to the County Councils, but making provision for compensation when licenses were withheld. The opposition of the Temperance party to these compensation proposals caused Mr. Ritchie to abandon his licensing scheme. Two years afterwards Mr. Goschen made another attempt to introduce a method of compensation in his Local Taxation (Customs and Excise) Bill. The intense opposition in the country compelled the Government again to withdraw the Compensation Clauses.

Side by side with the efforts for prohibition there has gone on an agitation for the entire closing of public-houses on the Lord's Day. Sunday closing was enacted for Scotland in 1853, for Ireland (the five principal cities excepted) in 1877, and for Wales in 1882; but England is still without this boon. Let us hope that the Temperance party will now concentrate its efforts upon securing entire Sunday

closing for the whole of the United Kingdom, a measure which would be sure to have the support of all who believe in the sanctity of the Sabbath, and of all who understand how essential the universal observance of a day of rest is to the health and general well-being of the community.

A review of licensing measures would be incomplete without some reference to the Scandinavian system, which during late years has received a great deal of public attention. This system originated in 1865 in the town of Gothenburg, in Sweden. A company was formed to operate a limited number of public-houses on the principle that no spirits should be sold in them except in conjunction with food, that no spirits should be sold on credit, and that the managers should be respectable persons who should derive no personal profit from the trade, all the profits being paid into the city treasury. The company has taken over the majority, though not all, of the spirit licenses of the city. This system does not touch the trade in beer.

The Swedish plan has been copied in Norway, where a two-fold system is in operation, viz., local option in rural districts and the plan of company management in the cities. The Norwegian plan differs from that of Gothenburg in this respect, that, instead of the profits going to the relief of the rates, they are devoted to helping charitable and philanthropic enterprises which are not supported by the rates.

Our space does not permit of a detailed examination of the Scandinavian scheme. Its advocates claim that

the elimination of the element of private gain from the traffic tends very greatly to mitigate its mischievousness. There is confessedly an improvement in Sweden and Norway, but it is very doubtful whether that improvement is due to the company system. The general sentiment of the best-informed temperance reformers is that the adoption of this method, or of any system of municipalisation, would be most dangerous, giving a new prestige to the public-house by exalting it into a municipal institution, and giving it a firmer hold upon the nation by increasing the direct interest of the whole community in the profits of the traffic.

At the election of 1895 a Conservative Government replaced the Liberal Cabinet which had been in power in the preceding Parliament. One of its early acts was to appoint a Royal Commission to investigate the whole subject of the liquor licensing laws. This Commission was constituted of three sections, one representing the trade, another the Temperance party, and the third section presumably representing the neutral people of the nation. After holding one hundred and thirty-four sittings and publishing a ponderous mass of evidence which is of incalculable value to the student of the question, this Commission published its reports in 1899. The Majority Report bears the signatures of the trade and the so-called neutral members of the Commission. The Minority Report is that of the temperance section of the Commission, but is distinguished by the fact that

it bears the signature of the Chairman, Viscount Peel, who held the office of Speaker of the House of Commons from 1884 to 1895, and who won for himself, during a period in Parliament of great excitement concerning the burning question of Home Rule, a great reputation for impartiality and for a judicial temper of mind. It is a great triumph for the cause of temperance that the evidence presented before the Royal Commission should have convinced a man of such eminence, who entered the Commission without any bias, that a much more thorough-going reform of the licensing laws is necessary than that which is embodied in the report of the majority. History will probably know the Minority Report by the title of "Lord Peel's Report."

These various reports are too voluminous to permit of a thorough examination here. It is, however, a subject for congratulation that even the Majority Report recognises the need for a reform of the existing method of administering the liquor traffic, and the following passage from its preamble is of permanent importance as being the indictment of the trade by some of its professed supporters :—

"It is undeniable that a gigantic evil remains to be remedied, and hardly any sacrifice would be too great which would result in a marked diminution of this national degradation. Nor is Parliament likely to rest satisfied with leaving things as they are, or to trust wholly to the influences we have described. The habit of needless indulgence in luxuries of all kinds, including superfluous drinking falling short of actual drunkenness, has probably increased, and is due to the general rise in prosperity,

often unaccompanied by a corresponding growth of moral responsibility, and leading in too many cases to a selfish neglect of obligations."

Of this Majority Report in general we must content ourselves with saying that it is delusive, and is on the whole calculated to strengthen the traffic, especially as all its proposals are based upon a scheme of full compensation for the value of a license whenever a license is terminated, except on the ground of misconduct.

The Minority Report, however, though stopping short of the programme of the Temperance party, contains a scheme of legislation which would be of immense benefit, and the friends of temperance will be foolish indeed if they do not embrace the opportunity which this report presents of enlisting in the cause of temperance reform a large number of persons who have not embraced the views which are held by the great majority of teetotalers.

Lord Peel's report proposes to deal with the vexed question of compensation in a manner which appears to me to be fair and reasonable, and which I think the most extreme temperance man might accept without any compromise of principle. The proposal, in brief, is that within seven years after the passing of the measure based upon the report the number of licenses shall be fixed at a low statutory maximum, not to be exceeded, of one on-licensed house to every 750 persons in towns, and to every 400 in country districts (this would be equivalent to a reduction of nearly half

of the existing licenses), and that the holders of licenses which are not renewed, if there are no convictions against the house, shall receive, *not compensation for the value of the license, but a commutation of the value of the unexpired portion of the time-limit of seven years*, that is to say, the holder of any licenses terminated at the first licensing sessions would receive, according to the suggestion of the report, seven years rateable value, those in the second year six years, in the third five years, it being enacted that there shall be no payment of commutation after the seven years have expired.

The other proposals of Lord Peel's report are far too numerous for a complete summary. I will content myself with a brief synopsis of its principal recommendations, taken from my article on the subject in the *London Quarterly Review* for January 1900 : —

"The agreements of tied houses to be subject to the supervision of the licensing authority; a register of all breaches of the law to be kept in the court, and to be produced at all licensing sessions; the disqualifications for serving on the licensing bench to apply also to the clerk of the licensing authority, and to watch committees; all licenses to be under the absolute discretion of the licensing authority; temporary transfers to be abolished, except in cases of death or bankruptcy; the licensing authority, after conviction, to have power to withdraw the license until the licensing session; the licensing authority to have full control over alterations of premises; hours of Sunday opening to be restricted to one hour at midday and two hours in the evening, with option to the licensing authority to enforce entire Sunday closing in their division, if they deem fit; entire Sunday closing for Monmouthshire;

frequenters of shebeens to be subject to arrest; travellers should be defined as persons about to lodge in the house or take a meal therein, who have travelled at least seven miles from their previous night's place of lodging; licensed premises not to be opened before seven or eight a.m.; the licensing authority to have power to close on election days; occasional licenses to be granted in open court by two members at least of the licensing committee after due notice to the police; sale 'on' or 'off' prohibited to children under sixteen; benefit societies to be prohibited from holding their meetings on licensed premises; coroners' courts, petty sessional courts, and revising barristers' courts to be entirely dissociated from licensed premises; music and dancing licenses to public-houses to be prohibited; after five years it shall be illegal for intoxicants to be sold on the same premises as other articles, thus abolishing, in effect, the so-called grocer's license; drunkenness alone to be sufficient ground for arrest; testimonials to superintendents of police to be disallowed; special inspectors of high rank in the police force to visit and occasionally report to the licensing authority concerning the conduct of the houses; special regulations with respect to habitual drunkards, including a black list of persons whom it shall be illegal to serve; strict regulations for clubs; at the expiration of five years a wide measure of direct popular control might be given to Scotland and Wales; the licensing authority to be composed of a number of magistrates elected by the justices and a number of persons elected by county or town councils."

The more I study this whole question of temperance reform the more deeply am I convinced that, although we ought strenuously to work and pray for legislative restriction of the traffic, nevertheless legislation is entirely subordinate to the propagation of teetotalism, and, indeed, depends for its success entirely upon the intelligent conviction of the community concerning

the mischiefs resulting from the sale of alcoholic beverages. With all the forces of appetite, habit, greed, and ancient custom which are arrayed against us, we should be utterly hopeless were it not that we are assured that Christ shall reign till all His enemies are made His footstool. Our chief work, therefore, must always be the dissemination of teetotalism in entire dependence upon the power of the Holy Spirit.

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